

JULY 15, 1961

AUTOMOTIVE INDUSTRIES

ENGINEERING • MANAGEMENT • PRODUCTION • DESIGN

A CHILTON PUBLICATION

GRAY IRON

PROGRESS REPORT... Page 57



Above: GIFS President John E. McIntyre, of Sibley Machine & Foundry Corp., with E. J. Hardig, Vice President and Chief Engineer, Studebaker-Packard Corp. The valve guides they are holding are cast without a draft or taper.

PAGE 57

ALSO IN THIS ISSUE...

PLASTICS IN THE AUTOMOTIVE INDUSTRY
MAKING ALUMINUM CYLINDER BLOCKS
ARCHITECTS OF THE AUTOMOTIVE FUTURE



CONTOUR BORIZING...

Adding Accuracy for Tape Control

by R. W. Mason
Chief Inspector
The Heald Machine Company

Three years of design and manufacturing experience and an outstanding background of performance records, on tape-controlled Model S Bore-Matics, have made two things clearly evident.

First — accuracy and reliability of these contour Boring machines have proved to be outstanding. Tolerances of $\pm .0001$ are repeatedly obtained in routine production.

Second — these results stem from a design and manufacturing accuracy which produce a unique machine capable of utilizing the full potential of today's most advanced numerical control systems.

To obtain this accuracy in building the machine, unusual manufacturing and assembly procedures are required and exceptional quality control and inspection techniques are employed. Some of these are of particular interest.

To prevent dimensional changes due to thermal effects during machine assembly, all work is done under controlled temperature in an air-conditioned room. To prevent strain and distortion, all screws on critical assemblies are tightened with torque wrenches to pre-determined design pressures.

All elements of straightness, alignment and tracking are measured with an Auto-Collimator which compares the work to a beam of light and reads to an accuracy of 0.1 of a second of arc (one second of arc is equal to .000005 per inch of length). All dimensional measurements are made with electronic indicators.

Hardened steel ways are assembled and honed in place to a straightness of .000050 or less, in their full length. Table and cross slide are actuated, in increments as small as .000025, by high-precision pre-loaded anti-friction ball screws. Bearing diameters for these ball screw assemblies are bored and honed in place on the machine, to assure precise alignment with the ways.

Tracking along each of the two axes is measured in two planes — horizontal and vertical — and must be accurate within .000025 in their full length of travel.

Obviously control measures such as these are not conducive to mass-production methods or other cost-cutting expedients. However, the results are well worth the extra effort. These machines track and repeat to the full potential of the numerical control system, sustaining production required for today's high precision contour boring and turning operations.



Heald tape-controlled Model S Bore-Matic for boring and turning irregularly-shaped work with a dimensional accuracy of $\pm .0001$ or better.

It PAYS to come to Heald

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

WORCESTER 6, MASSACHUSETTS

Part: Insert for car-door knob

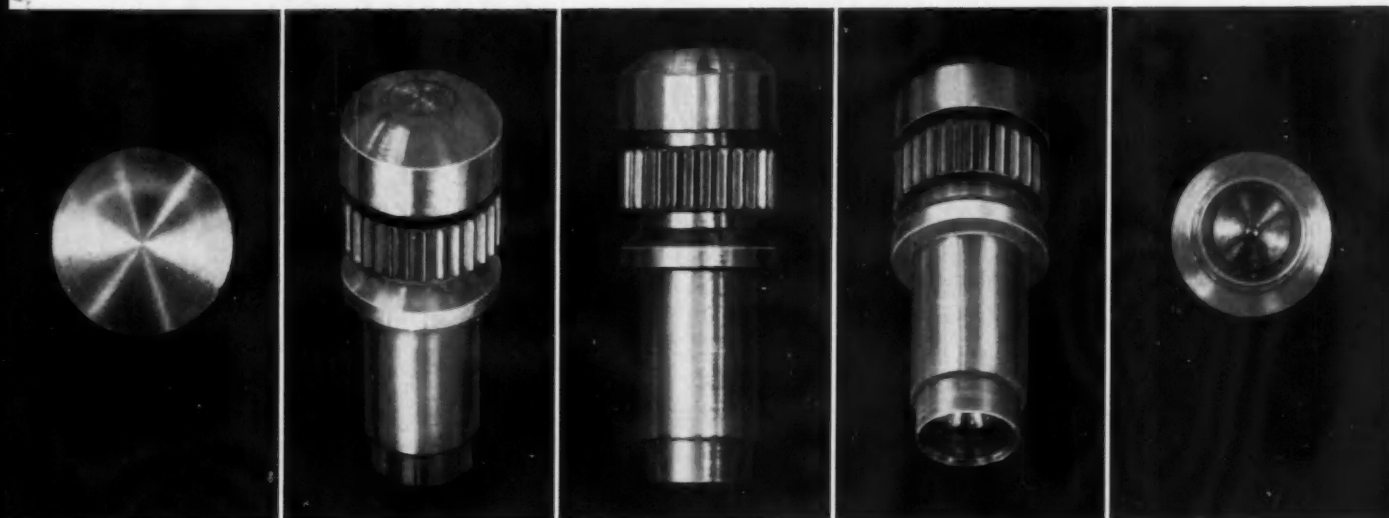
Screw Stock: 13/32 in. BETH-LED round, cold drawn

Chip Removal: 41 per cent

Cutting Speed: 284 SFM—up 29 per cent*

Production Rate: 1920 pieces/hour—increased by 33 per cent*

*over the control stock: C1213 non-leaded steel



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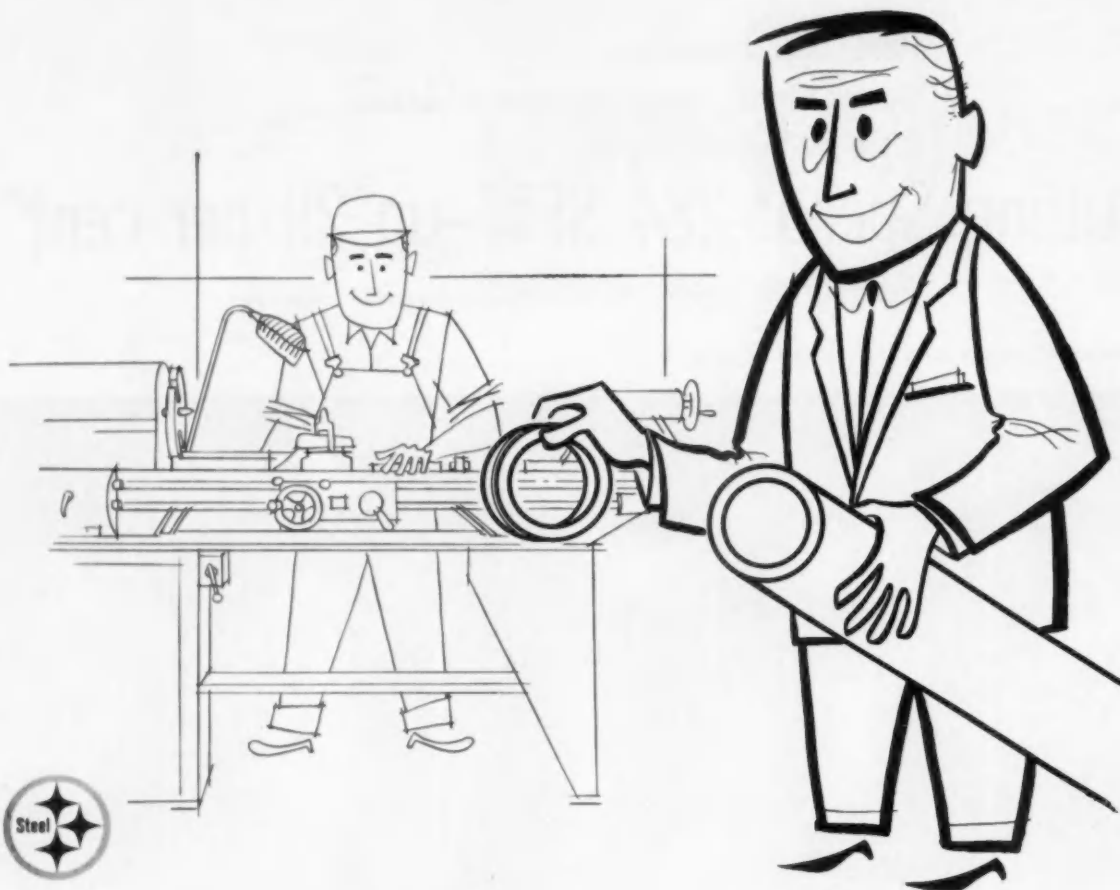
. . . Versatility

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JULY 15, 1961

Passenger Cars • Trucks • Buses • Aircraft • Tractors
• Engines • Bodies • Trailers • Road Machinery •
Farm Machinery • Parts and Components • Accessories
• Production and Processing Equipment •
Design • Production • Engineering • Management

VOL. 125, No. 2

Features • • •

▼ Gray Iron Leaders Aid Automotive Progress

Through its technical activities, the Gray Iron Founders' Society strives to achieve better casting design techniques, product improvement, and lower costs. It carries on an energetic educational program for its members and for users of gray iron castings.

Page 57

▼ Plastics in the Automotive Industries

Epoxies are replacing their machined metal counterparts as prototypes, short run dies, jigs, and inspection fixtures. This is the second in a series of special reports on plastics.

Page 65

▼ Numerically Controlled Machine Tools

The number of numerically controlled machine tools in the farm equipment and construction equipment manufacturing industries is steadily increasing. They are used on the production lines and in the experimental departments.

Page 72

▼ Architects of the Automotive Future

This is Part II of a two-part article devoted to a special tape-recorded conference

of leading automotive designers in the Industrial Designers Institute. Part I of this exclusive report was published in the June 15 issue of AUTOMOTIVE INDUSTRIES.

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▼ Production Techniques for Aluminum Cylinder Blocks

Special production methods are employed in making aluminum cylinder blocks and heads at the Central Foundry Division of General Motors Corp.

Page 77

▼ Special Tooling at IHC Plant Solves Production Problems

Single point cutting tools are used in International Harvester's East Moline Works to simplify tooling and to hold tooling costs to a minimum.

Page 78

▼ 29 New Product Items and Other Features Such As:

Machinery News; Manufacturers' News; Industry Statistics; and Government Contract Awards.

... continued on next page

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National Business
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Business Publications
Audit of Circulation

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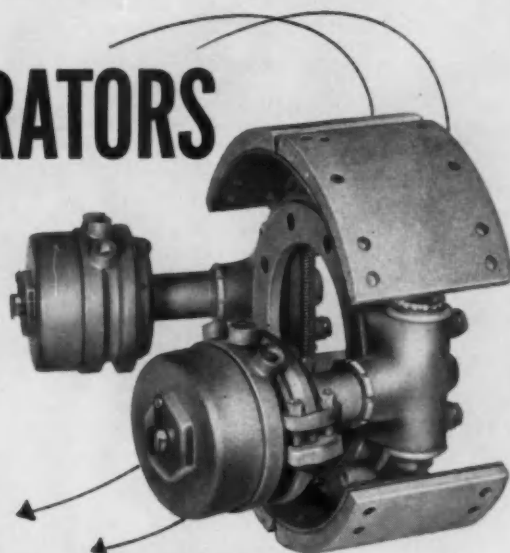
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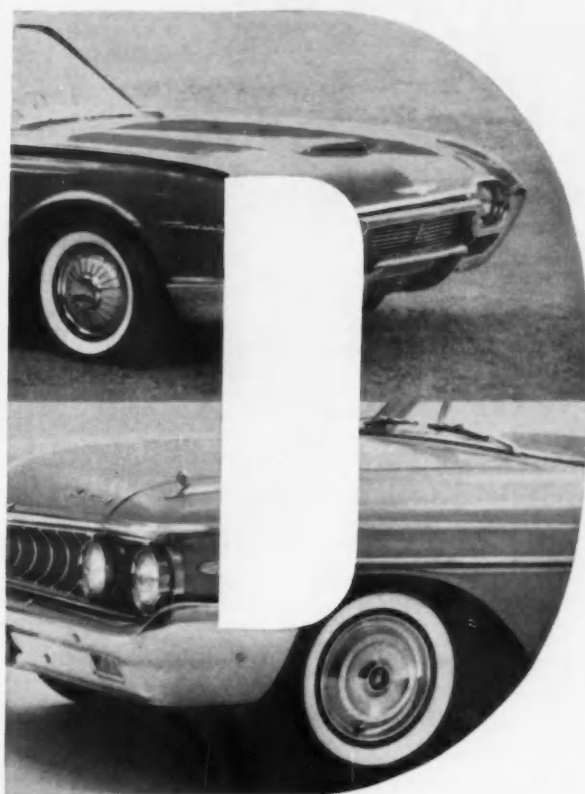
FORD MOTOR COMPANY PROVES THERE'S MILES OF DIFFERENCE BETWEEN ORDINARY RUBBER AND DU PONT ELASTOMERS

The Ford Motor Company didn't establish its 12,000-mile warranty capriciously. Components in every member of the Ford family of fine cars were checked, evaluated, proved or improved for long-term reliability and quality. In any single part, a few cents' upgrading at the factory might preclude a \$50 repair in the field.

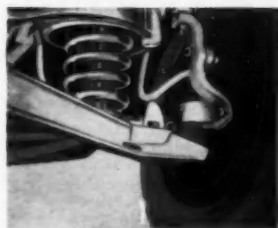
And for resilient parts—especially critical parts operating under difficult conditions—Ford turned again and again to Du Pont synthetic rubber to take over problem jobs that ordinary rubber just can't handle. For example, applications involving ruinous combinations of searing heat, gasoline vapors, oil, constant abrasion, weather exposure, high electrical voltages, ozone concentrations, extreme loads. In fact, Ford utilizes every member of the Du Pont elastomers family. Today, all of Ford Motor Company's 1961 cars and trucks use at least two of these products.

Where ordinary properties aren't enough, we suggest you, too, look to Du Pont synthetic rubber for better performance. For more information write E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Department AI-7, Wilmington 98, Del.

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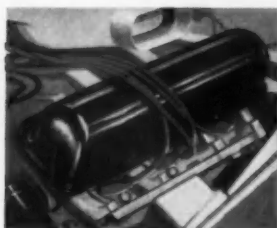
FORD MOTOR COMPANY USES THE ENTIRE DU PONT SYNTHETIC RUBBER FAMILY IN ITS 1961 CARS AND TRUCKS



ADIPRENE® ball joint seal is the key to Ford's new front suspension, which helps keep factory lubrication good up to 30,000 miles. Other advantages: outstanding abrasion resistance, high load bearing capacity and oil resistance. Long-wearing ADIPRENE is also used for gear selector linkage bushings.



NEOPRENE engine mounts are used by Ford because of neoprene's unique combination of properties — heat and oil resistance; good dynamic characteristics; low compression set and outstanding flex resistance. This versatile synthetic rubber is also used for heater hose, tail-gate seals, trim adhesives.



HYPALON® ignition cable jackets and spark plug boots provide superior protection against electrical failure. They defy heat, ozone, weather and abrasion... important factors behind Lincoln Continental's 24,000-mile warranty. Durable HYPALON is also used for bumper seals on the new Thunderbird.



VITON®, used in Ford truck carburetors and valve stem oil seals, performs reliably where other synthetic rubbers fail. Valve stem seals, for example, have given up to 150,000-mile service without failure. VITON remains stable at temperatures up to 600° F., resists aromatic fuels, lubricants, hydraulic fluids.



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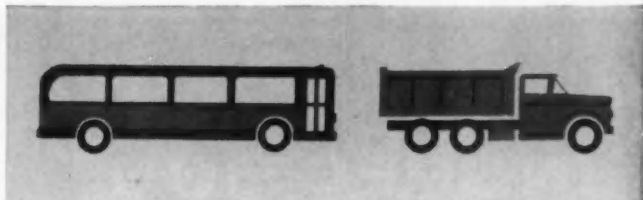
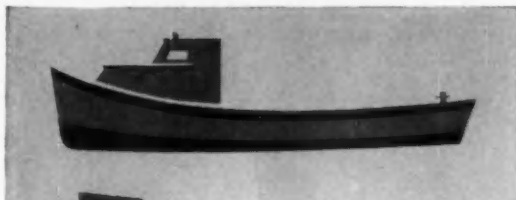
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CALENDAR

OF COMING SHOWS AND MEETINGS

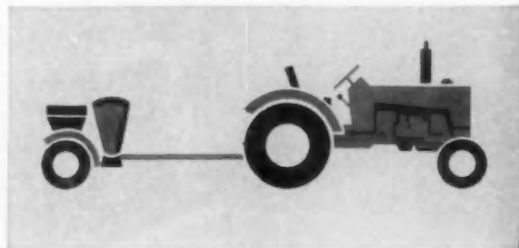
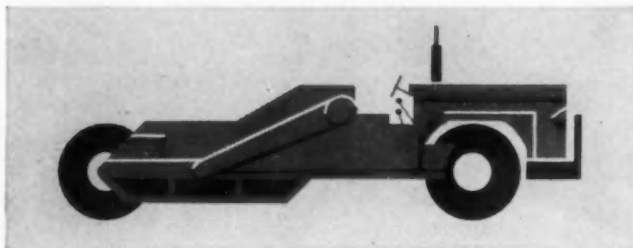
- Western Plant Maintenance and Engineering Show, Los Angeles
July 18-20
- Society of Automotive Engineers, West Coast Meeting, Portland, Ore.Aug. 14-17
- American Society of Mechanical Engineers, International Heat Transfer Conference, Boulder, Colo.
Aug. 28-Sept. 1
- Combined Farm, Construction and Industrial Machinery; Powerplant; and Transportation Meetings. (Including Production Forum and Engineering Display), Milwaukee
Sept. 11-14
- Instrument Society of America, Fall Instrument - Automation Conference, Los AngelesSept. 11-15
- Society of Automotive Engineers, National Farm, Construction, and Industrial Machinery Meeting, MilwaukeeSept. 11-15
- Society of Plastics Engineers, "Plastics for Tooling," Indiana Section, IndianapolisSept. 12
- Marking Device Association, Convention, ChicagoSept. 13-15
- Non-Ferrous Founders Society, Annual Meeting, Shawnee-On-Delaware, Pa.Sept. 18-20
- Steel Founders' Society of America, Fall Meeting, Homestead, Hot Springs, Va.Sept. 18-20
- 2nd Industrial Building Exposition and Congress, New York....Sept. 25-28
- American Production and Inventory Control Society, 4th Annual National Conference and Technical Exhibit, Chicago.....Sept. 26-29
- National Association of Corrosion Engineers, Western Regional Conference, Portland, Ore.Oct. 4-6
- American Machine Tool Distributors' Association, Annual Meeting, PittsburghOct. 4-6
- American Foundrymen's Society, 9th Ohio Regional Foundry Conference, CincinnatiOct. 5-6
- Society of Automotive Engineers, National Aeronautic Meeting, Los AngelesOct. 9-13
- American Standards Association, 12th National Conference on Standards, HoustonOct. 10-12
- National Screw Machine Products Association, Membership Meeting, White Sulphur Springs, W. Va.Oct. 12-15
- American Institute of Electrical Engineers, 1961 Machine Tools Industry Conference, Rockford, Ill.
Oct. 16-18
- Magnesium Association Annual Convention, New YorkOct. 16-18
- American Society of Lubrication Engineers, 8th Joint Lubrication Conference, ChicagoOct. 17-19
- American Society of Body Engineers, 16th Annual Technical Convention, DetroitOct. 18-20
- American Foundrymen's Society, Michigan Regional Foundry Conference, Michigan State U., MichiganOct. 19-20
- 1961 National Conference on Industrial Hydraulics, "Versatility and Reliability of Fluid Power," ChicagoOct. 19-20



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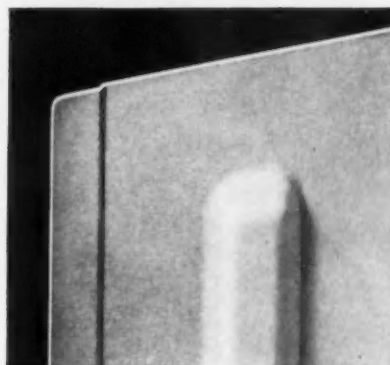


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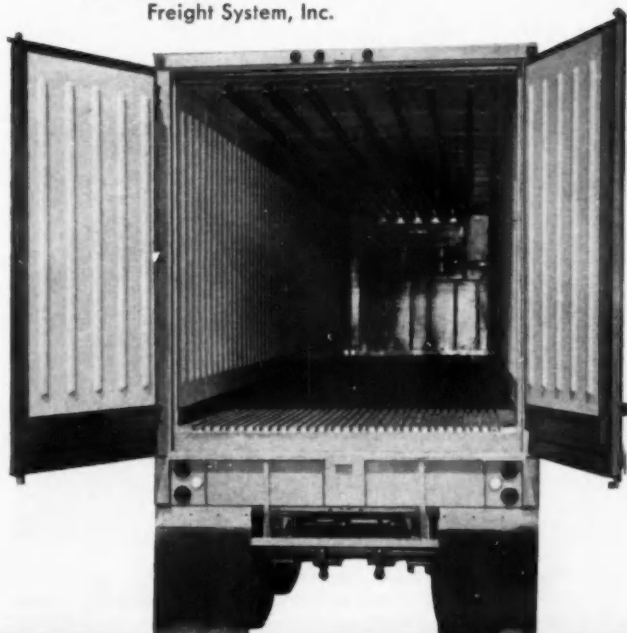
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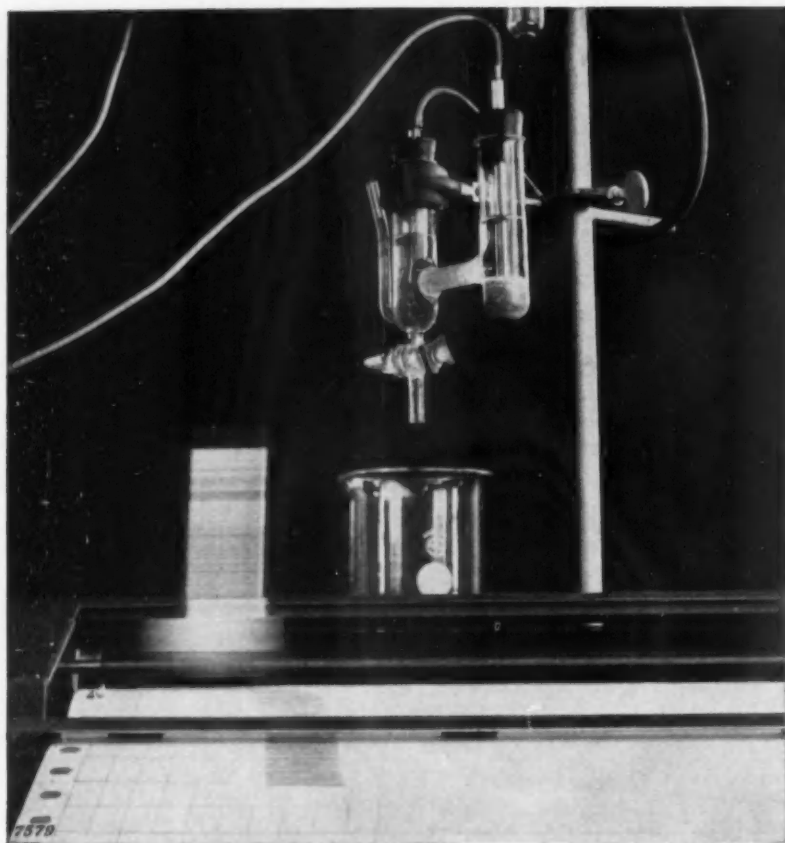
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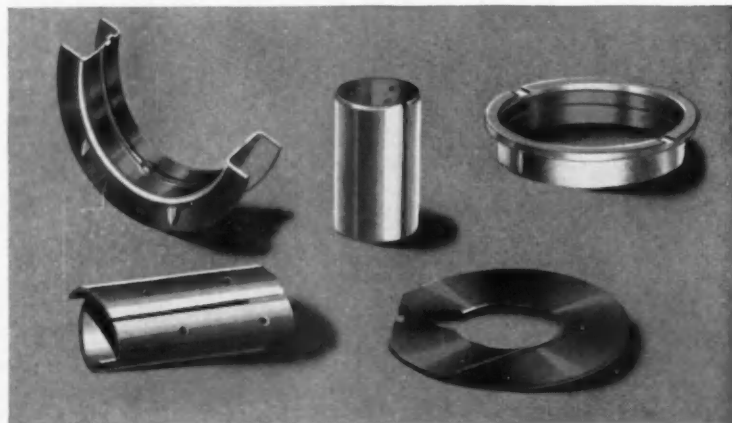


WE USE THIS HYPERSENSITIVE DEVICE TO TRACK DOWN ENGINE BEARING CORROSION TO ITS SOURCE.

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SUCCESSFUL BEARING PERFORMANCE

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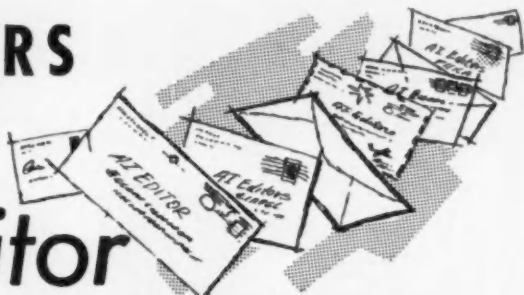
sleeve bearings
bushings-spacers
thrust washers

DIVISION OF
FEDERAL-MOGUL-BOWER
BEARINGS, INC.

LETTERS

to the

Editor



Readers' opinions or requests for additional information on material appearing in the editorial pages of **AUTOMOTIVE INDUSTRIES** are invited for this column. No unsigned letters will be considered, but names will be withheld on request. Address *Letters to the Editor*, **AUTOMOTIVE INDUSTRIES**, 56th & Chestnut Sts., Philadelphia 39, Pa.

DESIGN

Needless to say we are supremely delighted and excited by the June 15 issue of **AUTOMOTIVE INDUSTRIES** and the job it has done in furthering the case for styling.

The article on the Ford tractor is certainly a special bonus for industrial designers.

John Najjar
Executive Stylist
Advanced Studio
Ford Motor Co.
Dearborn, Mich.

DEIPS

After reviewing the materials sent regarding your new Design Engineering Improvement Planning Service, I have the following comments to make:

I like very much the standardized data sheets covering the items supplied by the various companies. One of the vexing features of manufacturers' catalogs has been that they come in all sizes, shapes, etc., which makes it extremely difficult to file all of them in a common file.

The reader service cards are a very good feature.

C. B. Anderson
Chief Engineer
Actionflex Corp.
Hastings, Mich.

STATISTICAL ISSUE

Thank you for your 43rd Annual **AUTOMOTIVE INDUSTRIES** Statistical Issue. There is a lot of data in this which will be of great interest to us.

J. J. Gullery
Dunlop Tire & Rubber Co.
Buffalo, N. Y.

GAS TURBINES

I have just read the "Gas Turbines for Automotive Use" article in your May 15 issue of **AUTOMOTIVE INDUSTRIES**.

If possible, would you please send me a reprint of this article or information on how I might obtain a reprint of it.

R. C. Kolhoff
Designer
Continental Aviation & Engineering
Toledo, Ohio

PRODUCTION PLANNING, A LA DEUTSCH

As an employee of one of the German automobile companies, I am preparing for my doctorate. The subject is "Planning Figures for Body Production and Assembly for Use by Top Management."

The purpose is to find out the general relation between the automobile body and certain factors necessary to produce it. The system of these planning figures is shown on the attached sheet. Such a planning figure would be, e.g.—

2000 sq. ft. floor space

1 produced body per day

which has to be corrected by the stated influence factors if necessary.

I know the figures of our own body and assembly plant as well as those of some European companies, but none for American factories. This is especially regrettable because your country has by far the highest and most advanced car production in the world.

I wonder whether you could give me some reference to rough figures for the stated factors of body production or provide addresses where I could ask. Probably published descriptions of modern stamping, body and assembly plants would be of help.

Rainer Frhr.v.Ebner
Daimler-Benz
Stuttgart, Germany

• We will be happy to provide all the information that can be developed—Ed.



Here's why
we're up to our ears
in screws!

Southern Screws

Regardless of the size, head style, material or finish of the standard fasteners needed for profitable assembly in your plant, Southern carries them in stock. This means that your order, large or small, can be on its way to you within hours after it is received, if you request rush service.

You are the reason we are up to our ears in fasteners! We're ready—today—to fill your order with USA-made Southern fasteners. Write direct to Southern Screw Company, P. O. Box 1360, Statesville, North Carolina for our current Stock List, or see your local Southern distributor.

Manufacturing and Main Stock
in Statesville, North Carolina

Warehouses: New York • Chicago • Dallas • Los Angeles

Machine Screws & Nuts • Tapping Screws
Stove Bolts • Drive Screws • Carriage Bolts
• Continuous Threaded Studs • Wood Screws • Hanger Bolts

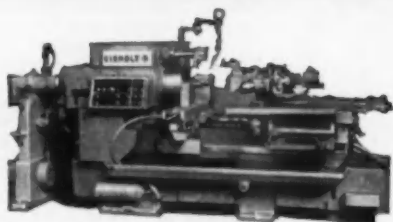
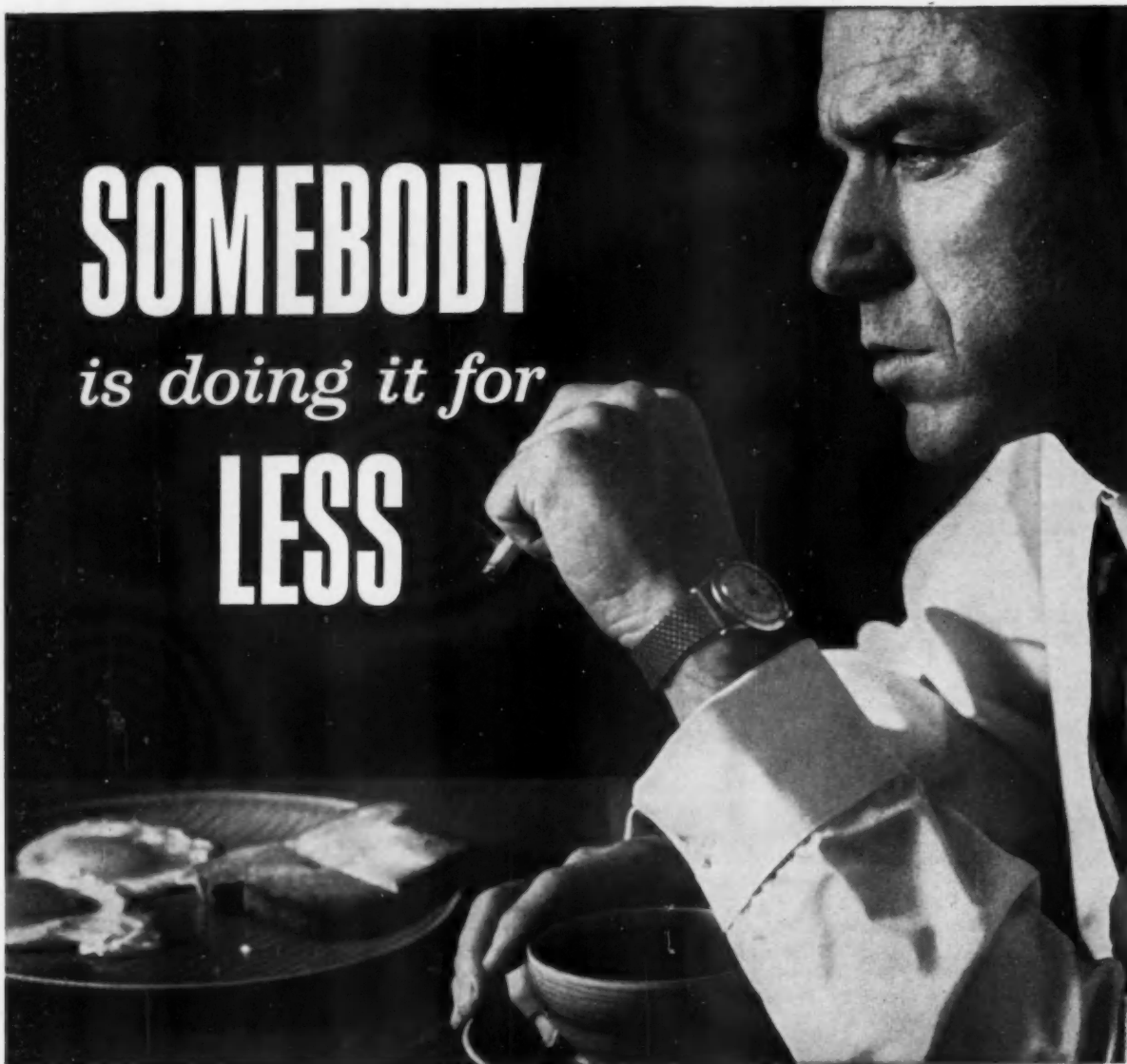


Circle 111 on Inquiry Card for more data

SOMEBODY

is doing it for

LESS



GISHOLT MASTERLINE® AR TURRET LATHE

Converts for bar or chucking work in less than one hour. Sets up like a turret lathe, uses same standard tools. Cycle setting learned in a day. Offers automatic drill withdrawal for chip clearing; internal threading with solid taps; external threading with self-opening die heads; reverse feed and individually adjustable dwell; 16 spindle speeds and infinite feeds—none lost when threading.

Ask your Gisholt Representative for a desk-side demonstration, or write for Catalog 1224.

Are you keeping step with new developments in automatic machining? Many of your competitors are—and cutting costs substantially.

Even small runs—both bar and chucking work—are now going automatic.

How? With the new, fast, easy setup designed into the Gisholt AR (Automatic Ram) Turret Lathe.

Change-over time is the same as for a hand-operated machine. And—the automatic cycle cuts machining costs 25% to 40%.


To be competitive you *must* go automatic. Why wait?



GISHOLT

MACHINE COMPANY
Madison 10, Wisconsin, U.S.A.

Turret Lathes • Automatic Lathes • Balancers • Superfinishers® • Threading Lathes • Factory-Rebuilt Machines with New-Machine Guarantee



Gown by
Fon Tayne
reflected in
stainless by
Crucible
Steel
Company
of America

Stainless by

CRUCIBLE

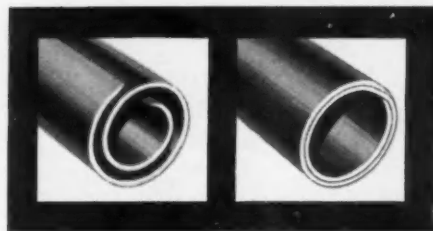
where a fine finish is only the beginning

Bundy can mass-fabricate practically anything

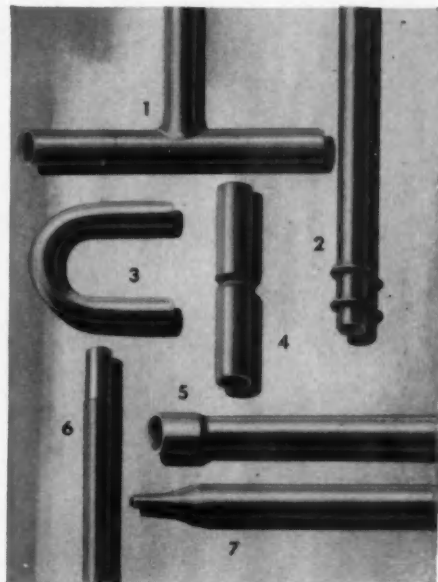


If you use tubing that requires fabricating—anything from simple bends to special forming and machining—it will pay you to talk to Bundy®. Many of these mass-fabricating operations have been developed by Bundy especially for automotive use, and one of them may solve a difficult tubing problem for you. Your parts will be mass-fabricated from Bundyweld, the leakproof *double-walled* steel tubing. Bundyweld has long been the safety standard of the automotive industry and is covered by ASTM 254; and Govt. Specification MIL-T-3520, Type III. Can Bundy help you? Phone, write, or wire: Bundy Tubing Company, Detroit 14, Michigan.

BUNDY TUBING COMPANY • DETROIT 14, MICH. • WINCHESTER, KY. • HOMETOWN, PA.
World's largest producer of small-diameter tubing. Affiliated plants in Australia, Brazil, England, France, Germany, Italy, Japan.



Bundyweld, double-walled from a single copper-plated steel strip, is metallurgically bonded through 360° of wall contact. It is lightweight and easily fabricated... has remarkably high bursting and fatigue strengths. Sizes available up to $\frac{5}{8}$ " O. D.



Small-diameter tubing components mass-fabricated by Bundy may be the answer to your design problem. The Bundyweld tubing shown above is: (1) saddled and soldered, (2) double-beaded, (3) bent to minimum radius, (4) grooved, (5) expanded, (6) precision-ground, (7) swaged.

BUNDYWELD® TUBING



Hi-Torque brakes provide positive control as giant Loader lugs 35 tons

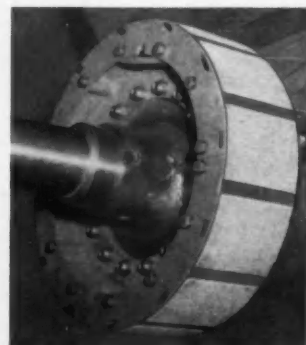
The heavy-duty requirements of this CARY-LIFT Loader, made by Pettibone Mulliken Corporation of Chicago, led to a thorough search for the best brakes available. According to the manufacturer: "Exhaustive tests proved to our entire satisfaction that Hi-Torque brakes were far superior to any other type available to us for our requirements."

The brakes on these Loaders provide gentle yet positive braking under all conditions, including operation with very heavy loads in snow, mud, and other adverse conditions. In addition to superior braking power, the manufacturer reports simplified assembly operations through standardization on Hi-Torques.

Investigate Hi-Torque brakes for maximum controllability and safety on your heavy-weight off-road vehicles. Now available on several makes of Loaders, Trucks, Tractors, Scrapers, Mine Vehicles. For information ask your vehicle manufacturer, or write *B.F. Goodrich Aviation Products, a division of The B.F. Goodrich Company, Dept. AI-7, Troy, Ohio.*

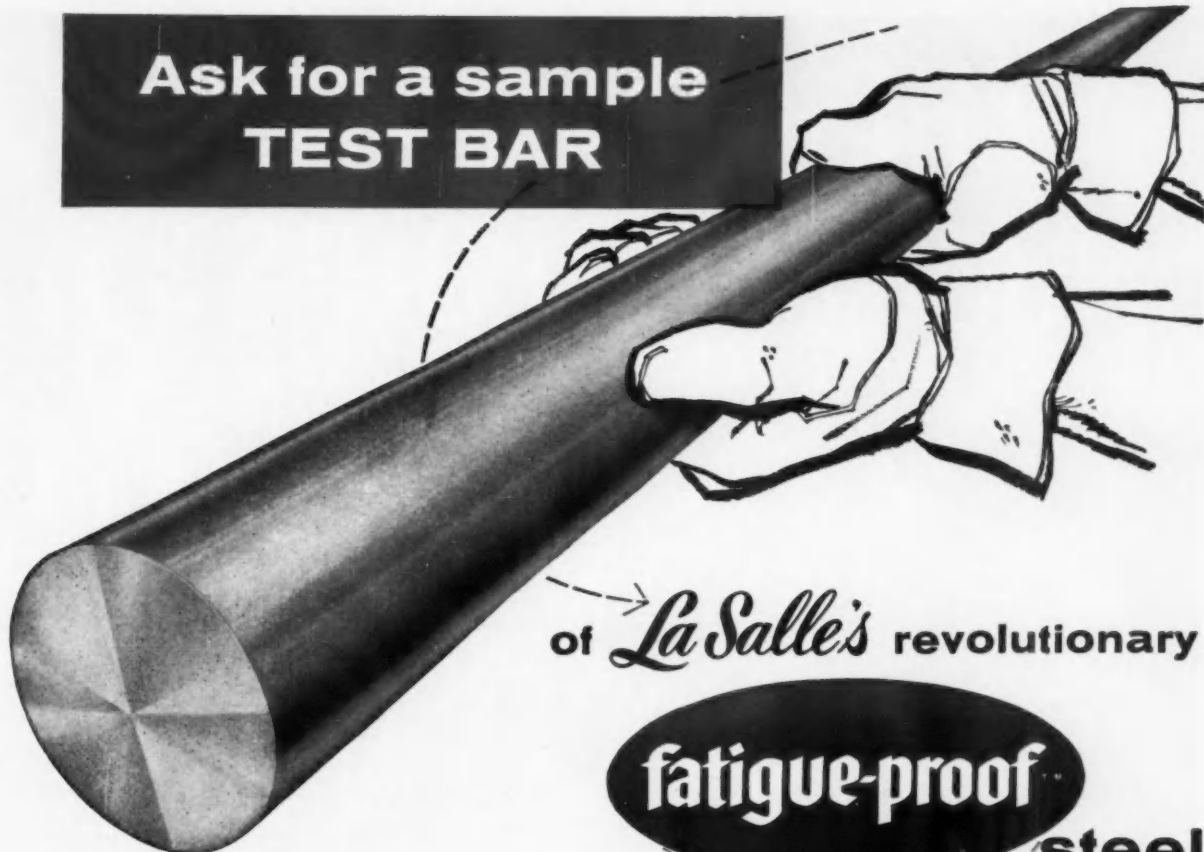


Hi-Torque brakes



Full circle contact with drum is provided by Hi-Torque brakes giving maximum effective braking surface in the same size unit. Hi-Torque stops vehicles twice as fast as conventional brakes.

**Ask for a sample
TEST BAR**



of *La Salle's* revolutionary
fatigue-proof
steel

**The steel bar that has
high strength WITHOUT
HEAT TREATING**

Yes, La Salle invites you to test a sample bar of the remarkable new **FATIGUE-PROOF**. This amazing new material is its own best recommendation . . . as proven by the many original equipment manufacturers who have already tested (and are using) **FATIGUE-PROOF**.

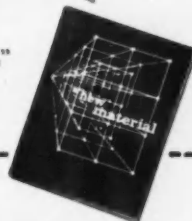
If you are making parts requiring strengths in the tensile range of 140,000 to 150,000 psi, and want to eliminate the expense or problems of heat treating . . . if you want to save production costs with a bar that machines faster (25% faster than annealed alloys—50% to 100% faster than heat treated alloys) and gives you a beautiful finish, too . . . if you want to improve the quality of your product while saving money, send us a blueprint, drop us a note giving application details, or better yet . . . pick up your telephone and call a La Salle sales engineer (REgent 4-7800, Chicago, Illinois).

MADE BY THE *e.t.d.* PROCESS

Elevated Temperature Drawing

FREE

Get your copy of "a new material," a 24-page booklet which gives detailed information on La Salle "**FATIGUE-PROOF**" steel bars.



La Salle STEEL CO.

1438 150th STREET • HAMMOND, INDIANA

Manufacturers of America's Most Complete
Line of Quality Cold-Finished Steel Bars

Please send me your "**FATIGUE-PROOF**" Bulletin.

Name _____

Title _____

Company _____

Address _____

City _____ Zone _____ State _____

THE AMPLEXOLOGIST





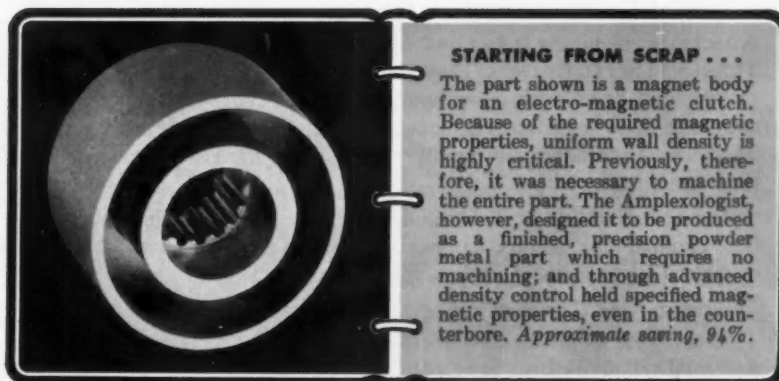
...STARTS FROM SCRAP

One thing about a scrap pile. You can walk around it. But you can't talk it away. That's why the Amplexologist—especially when he's calling on a manufacturer who knows little about powder metallurgy and cares less—often asks:

How much does it cost you to make this scrap?

Loaded question? Sure. Sometimes shakes a man up a little, too. Which is good: makes him more receptive to the word. Namely: advanced powder metallurgy uses only as much material as is necessary to produce a finished, precision part; a part which requires no machining and often costs no more than a rough casting. Eliminates waste material; eliminates the cost of *making* the waste. Often improves the product, too.

Well, once the message gets through—*m-o-n-e-y*—most manufacturers are eager for applications. Like, noon yesterday. Their enthusiasm for cutting out the scrap has helped make us the world's largest and most experienced producer of powder metal parts. Another reason leading manufacturers say: **When it comes to powder metallurgy, Amplex has the answer.**

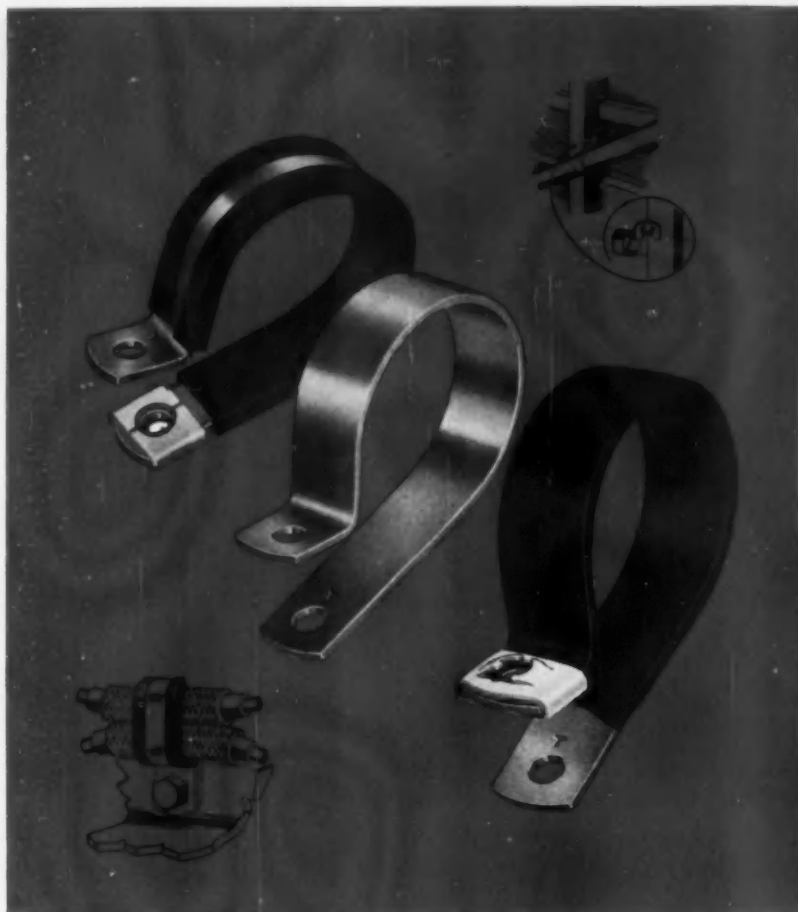


AMPLEXOLOGIST

AMPLEX

DIVISION CHRYSLER CORP., DETROIT 31, MICHIGAN





A T-Marked SPEED NUT Brand Fastener...

SPEED CLAMPS* go on fast, trim weight and parts handling

Attachment of tubing is fast and simple with vibration-proof Tinnerman SPEED CLAMPS. They are available in a wide range of sizes and types, with or without attached SPEED NUTS or neoprene flame-resistant cushions. They make firm, secure attachments and allow substantial savings in weight, assembly time and costs.

The complete line of Tinnerman SPEED CLAMPS includes hose clamps, tube clamps, harness clamps, and an assortment of special types to meet various requirements.

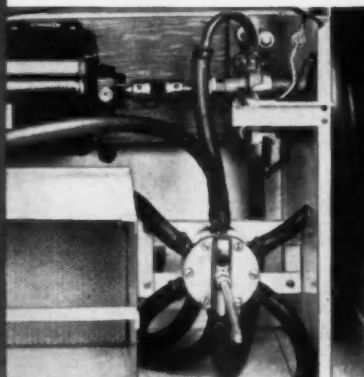
When buying clamps or spring-steel fasteners, look for the T-mark...your assurance that you're putting Tinnerman quality and total reliability into your products. For samples, literature, prices call your local Tinnerman Sales Office... listed in the "Yellow Pages" under "Fasteners." Or write to: *Tinnerman Products, Inc., Department 12, Box 6688, Cleveland 1, Ohio.*



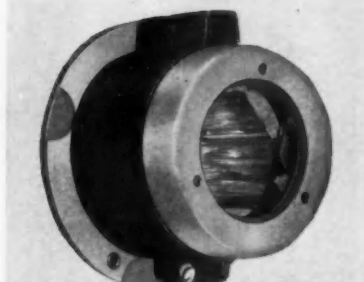
T-MARK ENGINEERED SPECIALS



TIME SAVING was the benefit when this Tinnerman Harness Clamp was used to fasten wire bundles to an aircraft structure. Inset shows safe, interlocking tongue and slot that can't spring open accidentally, yet opens readily for servicing without removing clamp from bulkhead.



ASSEMBLY SIMPLIFICATION resulted from a switch to Tinnerman Hose Clamps in this oil changer. One-piece SPEED CLAMPS are easy to apply, quickly secured with standard pliers. Savings in time and labor are substantial, excessive weight and parts handling are eliminated.



GREATER RELIABILITY is attained by television manufacturers with Tinnerman Deflection Yoke Clamps. They eliminate the problem of misalignment and broken connections resulting from rough handling, cushion the tube assembly under live spring tension.

CANADA: Dominion Fasteners Ltd., Hamilton, Ontario.
GREAT BRITAIN: Simmonds Aerocessories Ltd., Treforest, Wales. FRANCE: Simmonds S.A., 3 rue Salomon de Rothschild, Suresnes (Seine). GERMANY: Mecano Simmonds GMBH, Heidelberg.

J. WALTER REX tells why he chose Lindberg equipment for his new Florida plant

QUOTE from
Mr. Rex

"When we designed our new plant, Rex of Florida, Inc., we made sure we could provide the Florida metal working industry with complete heat treating services. After carefully surveying the industrial activities we would serve we knew we would be called upon to offer scientifically controlled, high quality heat treating for a variety of metals, both ferrous and non-ferrous, and an unusual diversity of sizes, shapes and weights. Our long experience with Lindberg furnaces and atmosphere controls assured us that we could depend on Lindberg equipment to help us meet most efficiently the widely varying demands of our Florida customers."



J. Walter Rex, President, Rex of Florida, Inc., Fort Lauderdale, with Lindberg high temperature, all-purpose furnace, one of six Lindberg units specified for this new plant. Mr. Rex, also President, J. W. Rex Company, Lansdale, Penna., is recognized as one of the foremost metal working authorities and his commercial heat treating operations are among the largest and most important in the country, particularly in treating components for rockets and missiles.

Mr. Rex's confidence in the ability of Lindberg equipment to meet the most exacting commercial heat treating requirements is based on the years of efficient and dependable service rendered by Lindberg units in his commercial heat treating operations. He has been a Lindberg customer for nearly 20 years. We're glad that he has found our equipment so satisfactory. We're very well satisfied with Mr. Rex as a customer, too. Altogether, including the units for Rex of Florida, Inc., he has purchased 34 Lindberg units over the years.

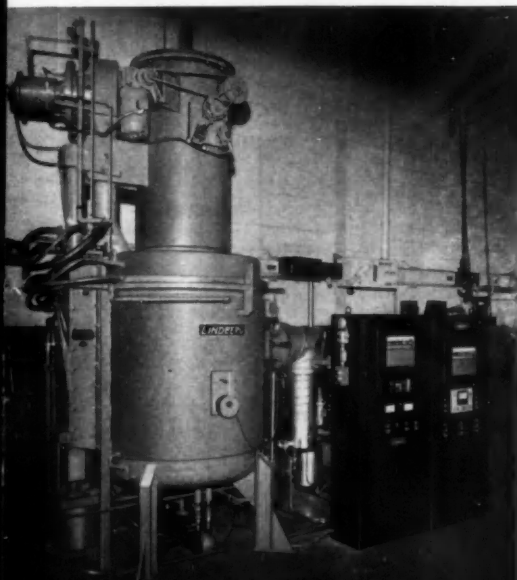
Lindberg offers the most complete line of fuel-fired and electric furnaces and equipment for heat treating ferrous and non-ferrous metals available to industry. If you have any problem in heat treating, get your local Lindberg representative's help now. You can depend on his experience and Lindberg's engineering and design know-how to provide exactly the right equipment for your need. And it's easy, too! Just call your Lindberg Field Engineer (he's listed in your classified phone book) or write us direct. Heat Treating Furnace Division, Lindberg Engineering Company, 2491 West Hubbard Street, Chicago 12, Illinois.

Los Angeles plant: 11937 S. Regentview Avenue, Downey, California. In Canada: Birleco-Lindberg Ltd., 15 Pelham Ave., Toronto 9, Ont. Also, Lindberg plants in Argentina, Australia, England, France, Italy, Japan, Spain, Switzerland and West Germany.

LINDBERG

heat for industry

Circle 119 on Inquiry Card for more data



Latest Rex purchase from Lindberg—new vacuum furnace for Lansdale, Penna., plant

The single, most important advance in the whole history of disposable tooling

Just 3 parts (not including insert) means minimum parts inventory, greatly reduced possibility of part failure, much less downtime, lower costs.

Streamlined silhouette because "clubheads," clamps, screws are eliminated.

15 styles, 124 sizes for triangular and square inserts. Shank sizes from $\frac{1}{2}$ " square (replace your brazed tooling) to 2" square.

Elimination of insert pocket results in larger end-cutting angle. Can be used on many tracer applications.

Minimum overhang of Carb-O-Lock reduces space requirements for locking mechanism.

Insert changing and indexing is a breeze. Turn wrench to unlock, replace or index insert, then turn wrench to relock.




New Carb-O-Lock toolholder-insert combination cuts tool costs up to 40%!

Save 30% and more when you buy it . . . 40% and more when you use it. The key to the new Carb-O-Lock: Simplicity!

Think of it! Now you can cut your disposable tooling costs by up to 40%! You save and keep on saving, because savings are designed right into the new Carb-O-Lock toolholder-insert combination.

Truly unique in toolholder design, the Carb-O-Lock employs just three parts (not including insert)—compared with up to 12 parts in other toolholders. Using a cam-action locking principle, the Carb-O-Lock toolholder makes insert changing and indexing easy as one, two, three! And the streamlined design of this revolutionary toolholder lets you bring it closer to the work, with unrestricted chip flow.

Carb-O-Lock toolholders are available right now in toolholder shank sizes from $\frac{1}{2}$ " square to 2" square for square inserts and $\frac{1}{2}$ " to $1\frac{1}{2}$ " on toolholders for triangular inserts. The specially processed disposable inserts have been developed in Carboloy® Grade 883 for machining cast iron as well as many operations on high-

temperature alloys, type 300 stainless steel, brass, and bronze.

They are held to tolerances of $\pm .002$ " on $\frac{1}{4}$ " I.C. to $\pm .004$ " on the 1" square and they cost 40% less than some precision-ground ($\pm .001$ ") inserts.

These inserts have cutting edges composed of whole carbide crystals which are stress free, and notch free like Carboloy Pre-Honed inserts. And, to make your changeover easier, Carb-O-Lock inserts are designed to fit most square or triangular negative rake toolholders you may now be using.

Carb-O-Lock inserts come skin-packed on a file-drawer size, color-coded card for easier inventorying, faster identification.

See just how this brand new toolholder-insert combination can bring better profits through better tooling in your metalcutting operation. Phone your Authorized Carboloy Distributor and place your order for the Carb-O-Lock toolholder-insert combination.

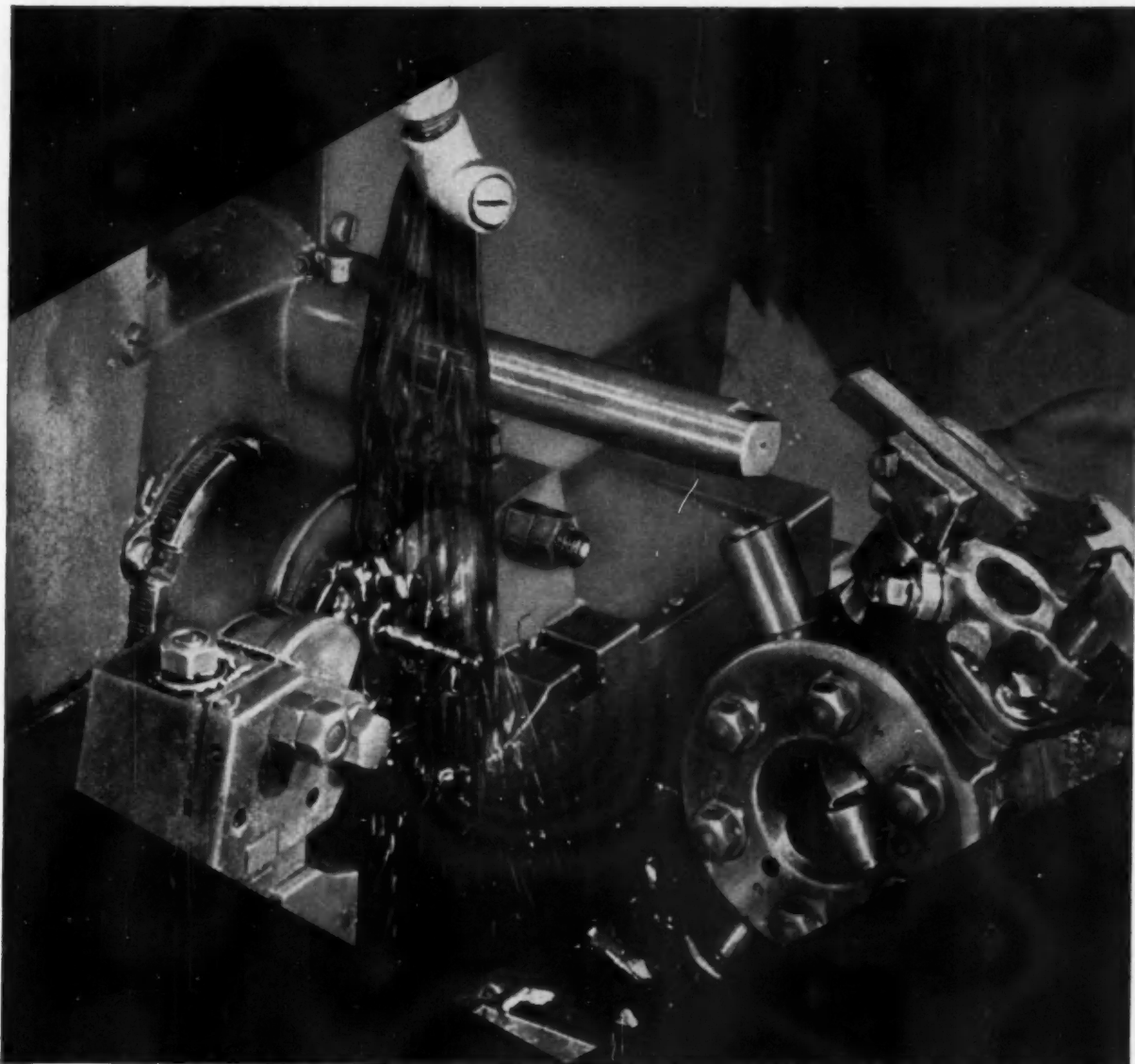
Great! . . . revolutionary!
Metallurgical Products Department of General Electric Company, 11151 E. 8 Mile Road, Detroit 32, Michigan.

CARBOLLOY
CEMENTED CARBIDES

METALLURGICAL PRODUCTS DEPARTMENT

GENERAL  **ELECTRIC**

CARBOLLOY® CEMENTED CARBIDES • MAN-MADE DIAMOND • MAGNETIC MATERIALS • THERMISTORS • THYRISTORS • VACUUM-MELTED ALLOYS



Replace those black, sulfurized oils! Get cooling, cutting properties you need in a transparent Sunicut cutting oil that lets operators *see* tools, workpieces, finishes and micrometer readings. Sunoco has a wide

range of high quality, non-emulsifying Sunicut cutting oils for general-purpose or special-problem operations. They pump easily, wet metal fast, have high film strength, will not stain operators' hands or clothing.

You'll see more than just the job...with Sunicut



You'll see significant savings, too, when you switch to a transparent Sunicut cutting oil. For you will get the exact *quality* you need for your operation . . . *job-fitted* by men who know what they are doing . . . teamed with *service* you never have to ask for twice.

Let a Sunoco representative get

you started with a Sunicut cutting oil now. The dividends in extra performance and savings will prove how right you were in investing in Sunoco quality.

Sun Oil Company, Philadelphia 3, Pennsylvania, Department AA-7. In Canada: Sun Oil Company Limited, Toronto and Montreal.

PIONEERING PETROLEUM PROGRESS FOR 75 YEARS



EVANS HEATERS ARE RIGHT FOR TRUCKS BECAUSE THEY'RE BUILT FOR TRUCKS

Evans heaters are durable, dependable, rugged—*built for trucks!* They're tailored to truck manufacturer specifications, custom-engineered to provide the *right* BTU rating and heat distribution *for your specific truck models.* They're designed for quick, easy maintenance. Product quality has made Evans the largest manufacturer of heavy-duty truck heaters. Evans' heater pro-

duction is backed by 25 years of engineering experience, rigorous tests and assembly-line inspections. And backing each individual Evans heater is a one-year/50,000-mile warranty.

Our engineers are ready to work with yours to design an Evans heater to meet your requirements. Write Evans Products Company, Dept. P-7, Plymouth, Mich.

*Hallmark of
Quality Products*

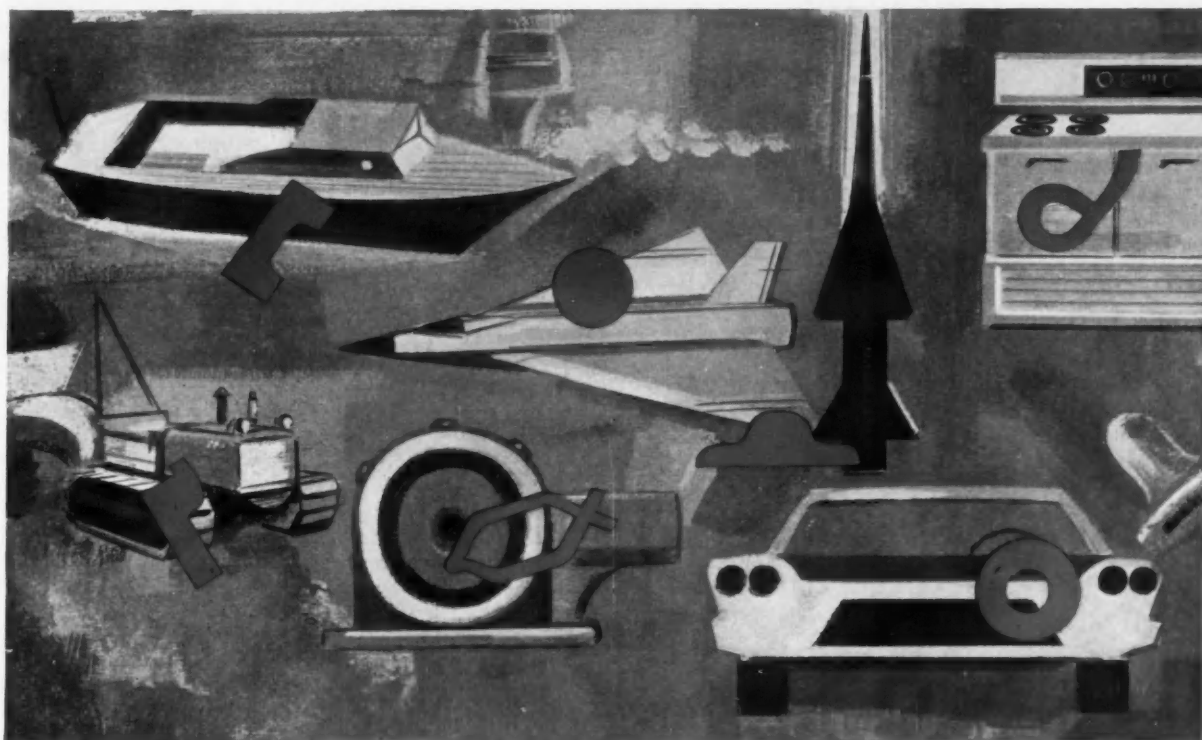


**EVANS
PRODUCTS
COMPANY**
PLYMOUTH, MICHIGAN

HEATING AND VENTILATING DIVISION

REGIONAL REPRESENTATIVES: Chicago, R. A. Lennox • Detroit, Chas. F. Murray Sales Co. • Allentown, Pa., P. R. Weidner

Design For Quality



SILASTIC Assures Trouble-Free Operation, Builds Lasting Brand Preference

Tomorrow's customers will demand quality. They'll demand trouble-free operation. They'll demand lasting durability. You'll have to meet these demands to maintain any kind of profit margin. Improvements in the design of your products will help. But more important in your *quality mix* is the selection of better, more dependable materials . . . materials like Silastic®, the Dow Corning silicone rubber.

Because Silastic is doing so many difficult jobs well, designers no longer challenge Silastic's immunity to deterioration by 500 F heat, -130 F cold, weathering, ozone, corona, and oxidation aging. Today's designers concentrate on making the most efficient use of the properties of Silastic to increase consumer satisfaction with products like frypans, automotive transmissions, range doors, tire valves . . . even baby bottle nipples. Thanks to Silastic, the rubber that never grows old . . . never gets tired . . . many of tomorrow's products will last longer, perform more efficiently, cost less to maintain. Will yours?

Over 100 Rubber companies manufacture these standard parts from Silastic:

- Seals and Gaskets
- O-Rings
- Mechanical Rubber Goods
- Coated Fabrics
- Ducting and Hose
- Extrusions
- Sleeving
- Electrical Tapes
- Sponge
- Wire and Cable

For more information about Silastic and list of parts suppliers, write Dept. 1319.




Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.





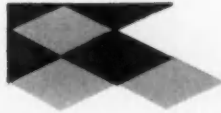
*Allied
Research*
FOR QUALITY
METAL FINISHING
PRODUCTS



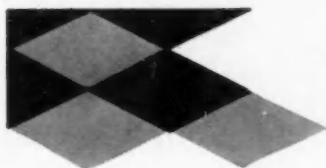
a quick quiz

... to help you
determine if you
are getting the
most for your metal
finishing dollar.

Check your answers to these three important supplier questions. Then, compare what you get when you buy from Allied Research Products, Inc.

PRODUCT VALUE	SERVICE	KNOW HOW
<p>Do I get the results I want at the lowest possible cost?</p> <p>Always _____ <input type="checkbox"/></p> <p>Sometimes _____ <input type="checkbox"/></p> <p>Seldom _____ <input type="checkbox"/></p>	<p>Can I get the kind of service I want — where I want it — when I want it?</p> <p>Always _____ <input type="checkbox"/></p> <p>Sometimes _____ <input type="checkbox"/></p> <p>Seldom _____ <input type="checkbox"/></p>	<p>Does my supplier know my industry's finishing requirements?</p> <p>Always _____ <input type="checkbox"/></p> <p>Sometimes _____ <input type="checkbox"/></p> <p>Seldom _____ <input type="checkbox"/></p>
 <p>Whether you want quality or economy . . . there's an Allied Research product designed to give you the best finish for the money. Specify your chemicals, equipment, or supplies for better finishing from this list:</p> <p>IRIDITE® conversion coatings for non-ferrous metals</p> <p>IRILAC® protective coatings for all metals</p> <p>ISOBRITE® plating brighteners</p> <p>ARP® process chemicals</p> <p>WAGNER electroplating equipment</p> <p>Other standard plating room chemicals and supplies.</p>	 <p>Allied provides a nation wide network of sales engineers and warehouses — service men and laboratories. Prompt product delivery or expert help is as close as your telephone. Check us out on promptness. Call your Allied Research man. Or, write direct if you'd like information on:</p> <p>Chemicals</p> <p>Equipment</p> <p>Supplies</p>	 <p>Allied has years of experience helping customers establish quality finishing standards. The performance of many Allied products has helped set quality levels for industry and government specifications in these industries.</p> <p>Military</p> <p>Aircraft & Missile</p> <p>Electrical</p> <p>Automotive</p> <p>Appliance</p> <p>Hardware</p>

Like to have a free Value Analysis of your metal finishing operations? Write direct or call your Allied Field Representative. He's listed in the Yellow Pages under "Plating Supplies".

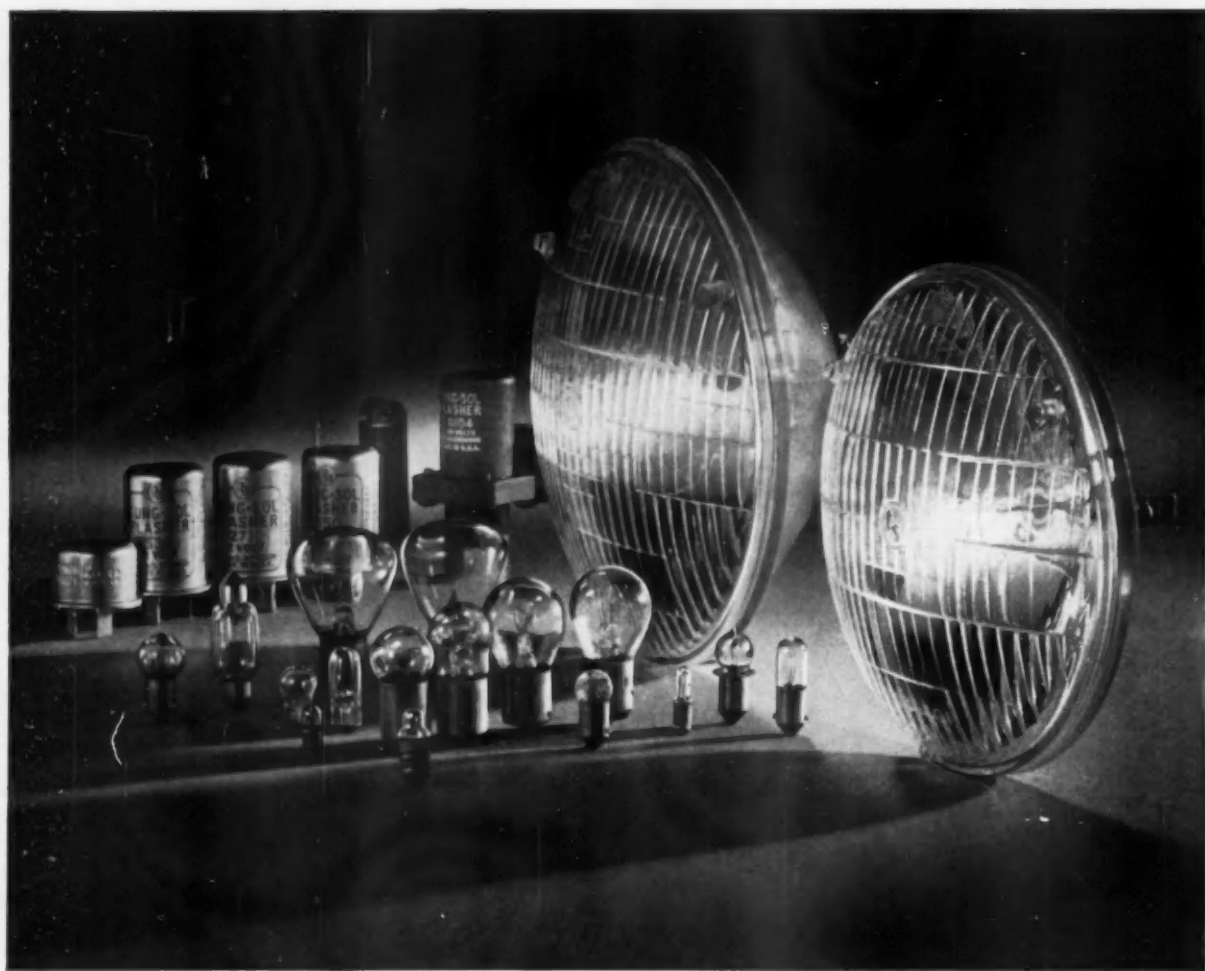


Allied Research Products, Inc.

4004-06 EAST MONUMENT STREET • BALTIMORE 5, MARYLAND

Affiliated operations in principal countries

Tung-Sol has achieved remarkable results in meeting the ever higher quality demands of the automobile industry while lowering the cost of Tung-Sol products



ts TUNG-SOL®

TUNG-SOL ELECTRIC INC., NEWARK 4, N. J./TWX: NK193

HEADLAMPS • MINIATURE LAMPS • FLASHERS

MIDLAND

MIDLAND VACUUM POWER BRAKE SETS NEW ENGINEERING STANDARDS

AUTOMOTIVE ENGINEERS CITE THESE FEATURES . . .

VACUUM SUSPENDED—power is continuously and instantly available for every application.

NO EXTERNAL RESERVOIR NEEDED—no additional plumbing and fittings required to accomplish ample engine-off safety.

POWER WITH ENGINE OFF—the vacuum suspended principle results in a series of power stops available in case of engine stall.

MASTER CYLINDER NOT SUBJECTED TO VACUUM—at no time (either applied or released) is master cylinder subjected to manifold vacuum.

HYDRAULIC SYSTEM REMAINS INTACT—the unit does not require additional hydraulic connections.

SIMPLE INSTALLATION—unit mounts on same bolts as provided for master cylinder in standard brake vehicle.

LOW PEDAL PROVISIONS—ample power available to warrant low pedal geometry and direct connection retains pedal "feel".

PROTECTED VALVING—the entire valve and force divid-

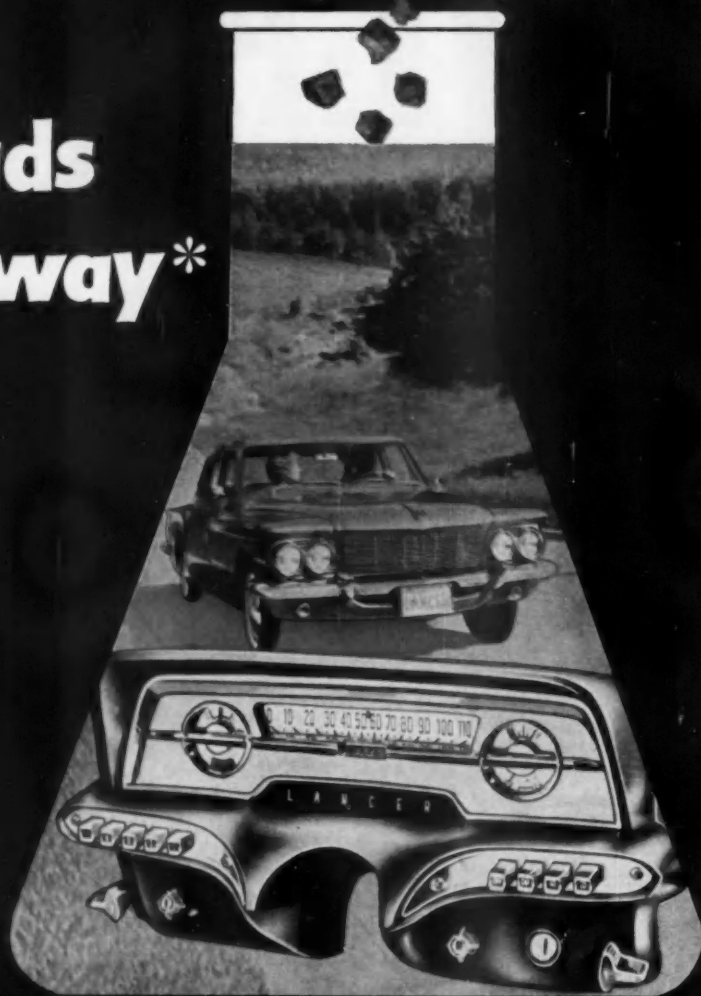
ing means is internal, protected from damage.

SAFETY EVEN ON FAILURE—failure of the booster or complete loss of vacuum in the system will not impair full use of physical pedal effort on the master cylinder.

For further information write: Midland-Ross Corporation, Owosso, Michigan.



it leads
the way*



Lancer Instrument Cluster molded by Kent Plastics — Evansville, Ind.



CYCOLAC® BRAND

TOUGH, HARD, RIGID POLYMERS FROM BORG-WARNER

It's another great one from Dodge . . . the Lancer Compact. And no wonder. Just look at this style-trimmed instrument panel cluster molded of CYCOLAC brand ABS polymers. Pounds lighter than metal, it's strong and tough, will never rust, stain or tarnish. Warm and smooth to the touch, molded parts of this ABS material remain new-looking for the life of the car. Economical, too . . .

a cluster can easily be produced in intricate shapes and vacuum metalized without difficulty. Installation is fast, simple. No marring or scarring; little post-installation finishing required. And CYCOLAC brand polymers are colorable too . . . to exactly match-meet the myriad of automotive finishes.

Proof again that this Borg-Warner material is the most versatile of all plastics.

Investigate . . . for full details write Dept. C-7.

MARBON CHEMICAL

WASHINGTON



DIVISION **BORG-WARNER**

WEST VIRGINIA

CYCOLAC is the registered trademark of Borg-Warner

Circle 127 on Inquiry Card for more data

AUTOMOTIVE INDUSTRIES, July 15, 1961

NEW Binks pump delivers 15 G.P.M.

pumps paint to 50-60 stations a block away and 6 stories up!

The all new Binks Model 41-6900 Hi-Capacity Pump is designed for hard continuous duty in paint circulating systems where large quantities of paint must be pumped through miles of piping.

The new Binks 3½ to 1 ratio air operated pump has proved performance in large automotive plants where they have been running constantly for more than eight months, *making over one million strokes, with no downtime!* One manufacturer pumps paint 6 stories high from remotely located mixing tanks to 50-60 spray stations a block away!

Check these NEW pump features:

New air motor which adjusts automatically to the amount of

paint used. Pumps on both the up and down strokes. You get more paint with less pulsation.

New unit design means you can make rapid and simple replacements without dismantling the air motor.

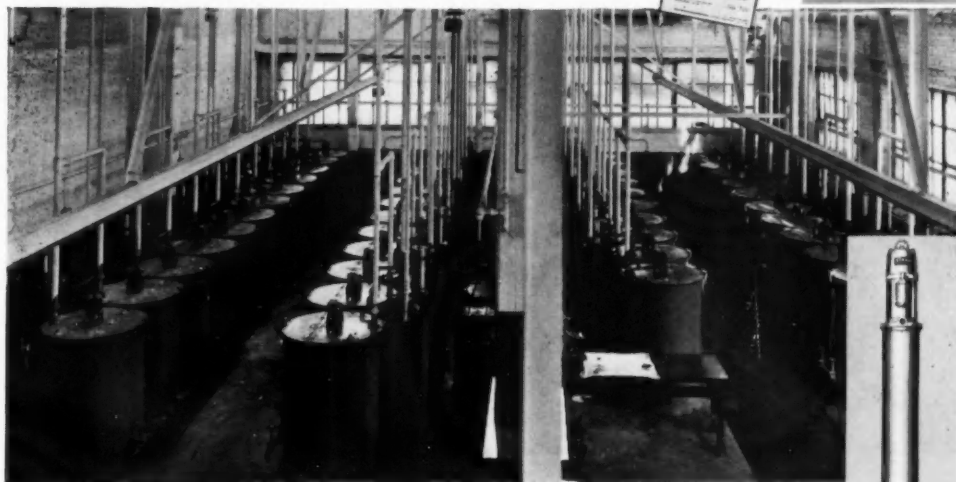
New nylon fluid valve discs with hardened seats prevent valve chatter and shock noise. They're reversible, too, for longer life.

New piston arrangement extends seal life.

New ball check allows free delivery of material with least restriction . . . less air consumption per gallon of material delivered.

Plus . . . all parts subject to wear are made of special steel, hardened for longer life.

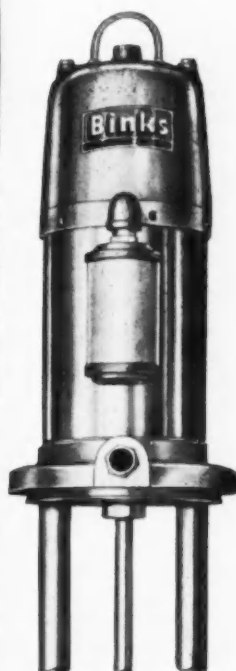
Ask for Bulletin A41-23 to get all the facts. For your copy see your local Binks Distributor or write us.



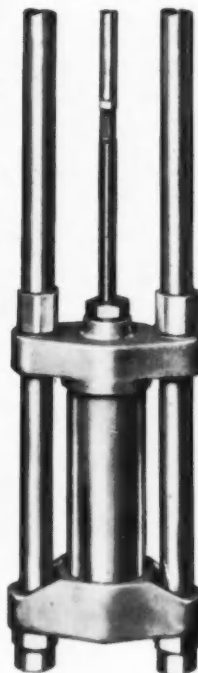
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Binks Manufacturing Company 3134 Carroll Avenue, Chicago 12, Ill.

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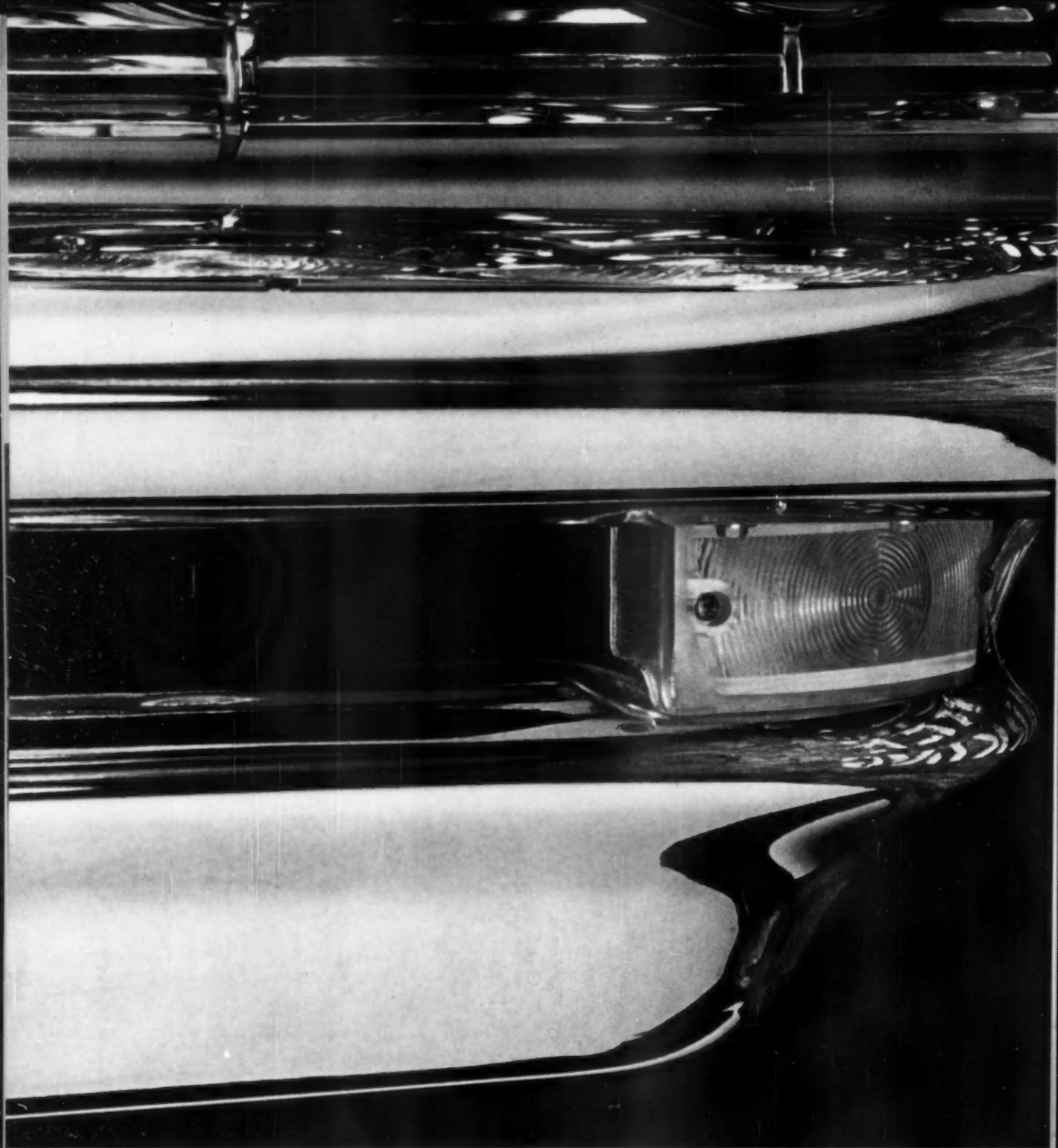
- New air motor
- New unit design
- New nylon fluid valve discs
- New piston arrangement
- New ball check



New Binks Model 41-6900 Hi-Capacity Pump

1233

Binks Everything for spray painting



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Car buyers want steel bumpers for their greater strength and the way they take parking bumps and impacts without denting or dimpling. Automotive designers want the freedom of design that comes with steel's ability to take deeper draws and more intricate forming than lighter metals such as aluminum. Production engineers want steel's superior fabricating qualities and lower polishing costs. They *all* want steel's extra margin of safety.

When it comes to bumpers (or other parts that require strength, design flexibility and low manufacturing costs), steel is stronger—looks better longer. Great Lakes Steel Corporation, Detroit 29, Michigan.



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NEWS

Vol. 125, No. 2

July 15, 1961

Changeover Time Nears 6 New Lines, Compact Convertibles Due

By James Dunne, Detroit Regional Editor,
and C. B. Campbell, News Editor

With changeover time rapidly nearing, reports of 1962 models indicate six new lines and compact convertibles will be the big news.

Ford's new cars—between Falcon, Comet and Ford—will be named Fairlane and Meteor. They will be about six or seven in. longer than the Falcon, but four in. shorter than the Ford.

Studebaker-Packard Corp., which already has closed down its 1961 production, is said to be planning a car about the same size as the new 115-in. models. It reportedly will be larger than the Lark Cruiser, an expanded compact, which was added to S-P's '61 lineup.

Plymouth, Dodge Models

Detroit's efforts to cover every segment of the market is illustrated by Plymouth and Dodge plans to each build one model in the 115-in. wheelbase range to compete with the Fairlane, Meteor and the newest Chevrolet.

Chevrolet and Ford have tooled up for cast iron blocks on their new lines.

Ford's engine will be a 221 cu in. V-8 developing 140 hp. Several of its components, including the bell housing and water pump case, will be aluminum.

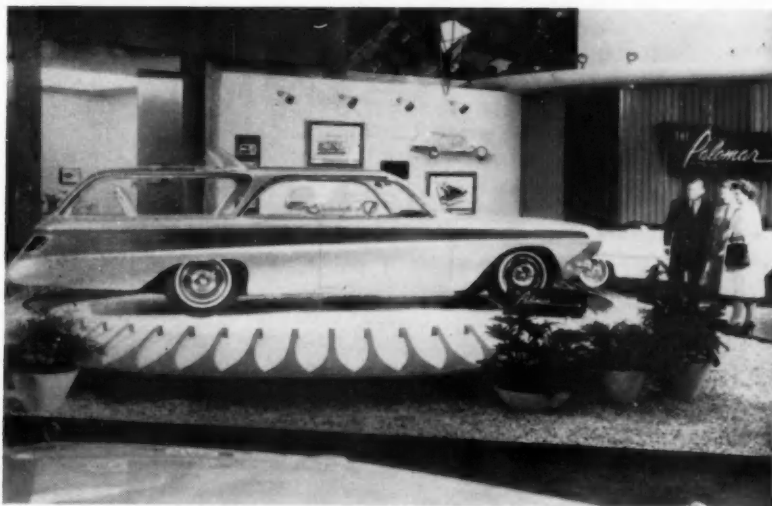
Chevrolet is said to be planning a four-cylinder engine that can be used in either the Corvair or its newest model.

No great significance should be placed on Chevy's new cast iron four and six-cylinder engines since the aluminum engine in the Corvair has proved to be one of its best selling points and will be continued.

Buick and Oldsmobile, despite widespread reports, are more than satisfied with the aluminum engines in their compacts.

Compact body styles present an-

'FLYING BRIDGE' STATION WAGON



Occupants of rear seat of Ford's Palomar, a "dream car" station wagon, have view above roof line. It has a sliding roof section and lounge seats with bucket inserts. It is 220 in. long, 78 in. wide, 55 in. high and has a 119-in. wheelbase. Palomar is feature of Ford's summer show at Dearborn, Mich.

other area where there is a wide difference of opinion among manufacturers.

Presently, only Lark and Rambler American have convertibles. By this time next year, Comet, Falcon and Corvair may be the only lines not offering convertibles. And they could quickly swing into line if the customer demand for convertibles increased.

Talk has been heard that General Motors plans a Pontiac Tempest convertible and hardtop. If this happens, similar models also can be expected on the Oldsmobile F-85 and Buick Special. All use the same body shell.

Another new car, Ford's small, small Cardinal, is not scheduled for its American introduction until winter. Ford's plans have been governed largely by their success with Comet, which was introduced in March, 1960, and quickly caught on with the public.

The swing to bucket seats is expected to continue in '62 models. Chrysler is reported ready with bucket seat editions in all makes. It also is testing a Thunderbird-type four-passenger car.

Borgward Talks Fail

The British Motor Corp. has called off tentative plans to buy part of the German Borgward auto company.

A B.M.C. executive has told Dr. Carl F. W. Borgward the British concern is no longer interested in the deal. B.M.C. reportedly backed out of the takeover partly because of its own expansion program in Britain.

Borgward, in financial trouble earlier this year, and taken over by the Bremen government, reportedly is now negotiating with Chrysler Corp.

Dr. Borgward, former sole owner, has an option to buy back full control of his firm.

Military Orders

Chrysler Corp., Studebaker-Packard Corp., and Willys Motors have been awarded contracts totaling \$39.3 million for military vehicles and parts.

Chrysler received contracts for 8503 military trucks, ambulances, and weapons carriers. The contracts total \$34.7 million.

Major portion of the production covered by the new contracts will

be 7175 M-37 military trucks. Also to be built are 278 M-43 ambulances and 1050 M-601 weapons carriers.

Studebaker - Packard's award was the third for the company in 26 days bringing their total of military contracts for the year to \$31.4 million. This latest contract for 646 two-and-one-half ton trucks amounted to \$3.5 million.

The award to Willys Motors amounted to \$1 million for the production of 400 Jeep vehicles. This is the second contract awarded Willys recently. Previously, the firm received an order for 1150 Jeep ambulances valued at \$3.2 million.

NEW MG MIDGET HAS TWIN CARBURETOR



Only 13 ft long, the Midget is B. M. C.'s first one-liter model in 25 years. It has a twin carburetor 57.8 cu in. engine with a 9 to 1 compression that delivers 46.4 hp at 5500 rpm. A sub-hull supports mono-constructed body. Bolt-on front fenders are easily detachable for repairs or replacement.

Safety Belt Drive

A nationwide program to persuade American motorists to use safety seat belts has been launched by the National Safety Council, American Medical Association, U. S. Public Health Service and the Advertising Council.

Dr. E. Vincent Askey, AMA president, praised the recent decision of major manufacturers to install safety belt mounts in their '62 model passenger cars.

George C. Stewart, executive vice president of the safety group, said 5000 of 38,200 automobile deaths in 1960 would have been prevented by the use of safety belts.

Lubrication Engineers

Dean M. Cleaveland has been elected president of the American Society of Lubrication Engineers.

Business Surge Seen

A Ford Motor Co. economist told the Chamber of Commerce of the United States that he sees clearing and sunnier financial skies for the rest of 1961.

Speaking at the Chamber's Business Outlook Conference, T. J. Obal, Ford senior economist, forecast:

1. A \$530-billion annual rate for the gross national product in the fourth quarter, compared with \$500 billion in the first quarter and \$512 billion in the second.

2. Continued, but less spectacular, economic improvement for the second half of 1961.

3. Total retail sales of 5.9 million new cars this year, including foreign makes.

4. Stronger demand for trucks and used cars.

5. An increase of up to \$4 billion in discretionary income — money left over after essentials are bought—in the next six months.

Although his forecast was optimistic, Mr. Obal said he did not see a full-blown boom in the next few months.

"The conditions necessary for a boom are not apparent at this time," he said. "It would have to be generated by sharp rises in one or more of the following: (1) new plant and equipment spending, (2) business inventory building, (3) consumer durables purchases, and (4) government spending. These areas will warrant serious analysis in the coming months."

Eaton Research Unit

Eaton Manufacturing Co. has officially opened its \$1.3 million research center dedicated to the development of new products, new ideas and new processes for the company's various subsidiaries and divisions. The building is located on a nine-acre site in Southfield, Mich., just north of Detroit.

Housed in the new center is another \$1 million worth of mechanical, metallurgical, chemical and electrical equipment for use in the company's expanded research and development program.

Thirty engineers, under the supervision of Sidney Oldberg, director, and Robert Brown, associate director, are engaged in research at the laboratories.

The metallurgical laboratory is equipped for metal spray coating, welding, casting, powdered metal work, stress rupture testing, heat treating, and surface coating experiments.

Four dynamometers, accommodating eight stands for the testing of engine components such as valves, valve seat inserts, tappets, transmissions and other power transmitting devices, are located adjacent to the mechanical laboratory.

A special dynamometer room, equipped with a test stand and a large water tank, is used for marine development work.

Other facilities in the Research Center include a fabrication room, a brake testing facility, an instrumentation room, stress study room, service group quarters, machine shop, photographic laboratory, and a large road test garage.

TRIUMPH HERALD HAS LARGER ENGINE



Latest Triumph Herald is powered by larger 70-cu in. engine rated at 39 hp at 4500 rpm. Transmission includes new close-ratio gearbox and higher (4.1 to 1) axle ratio. Improved bodywork features white rubber bumpers and polished wood facing on the pressed-fiber dashboard.

NEWS

CONTINUED

New Turn Signals

A new automotive lighting system for turn signals that would increase daytime visibility without making them too bright at night is under development.

The Automobile Manufacturers Association, engaged in the work with lamp producers, said the "dual intensity" system is expected to be adopted, but gave no introduction date.

The "dual intensity" feature would be applied to rear turn and stop signals, but not to front turn signals. They must retain sufficient intensity at night to be seen against the brightness of headlights.

Daylight brightness of the signals would be two to four times higher than those in use now, but when the headlights are turned on the rear signal brightness would be lowered to prevent glare for following drivers.

The AMA also revealed two other safety advances in lighting

systems that are under study. They are amber lenses for front turn signals, replacing the traditional white lights and use of a blue spot of light instead of red on the instrument panel to warn drivers that upper beam headlights are on.

Still a matter of controversy is the standard location for rear lights. Some manufacturers are reluctant to lose the rear end identification of their models.

Ford's Africa Plant

The first cars have been produced at Ford Motor Co.'s \$4.2 million plant at Salisbury, South Rhodesia.

First month's production will concentrate on the firm's biggest seller overseas—the Zephyr. Within the year the plant will turn out other Ford models including Zodiacs, Anglias, German Taunus and Canadian Falcons as well as tractors and trucks.

VW Price Rise?

Higher prices for the Volkswagen have been forecast by Dr. Heinz Nordhoff, general director of the German manufacturer.

Dr. Nordhoff told the firm's first stockholders' meeting that rising costs make higher prices a "distinct possibility." He did not say when prices would be raised, but observers felt that new prices would be announced in the fall along with 1962 models.

'62 Motor Boat Show

Applications for space and floor plan brochures for the 52nd National Motor Boat Show have been mailed to members of the sponsoring National Association of Engine and Boat Manufacturers, Joseph E. Choate, show manager, has announced.

The annual exposition, the world's largest boat show, will open to the public at the New York Coliseum on Saturday, Jan. 13, starting a nine-day run through Sunday, Jan. 21. The 1962 edition of the display is expected to top the attendance of 326,500 tallied last January.

Helicopter Award

Leon L. Douglas, director of engineering, Vertol Div., Boeing Co., has been presented with the Dr. Alexander Klemin Award of the American Helicopter Society.

The award was in recognition of Douglas' "numerous and important contributions to the development of the tandem rotor helicopter and other vertical takeoff and landing craft."

Army Orders Engines

The Army has awarded a \$1.1 million contract to the Detroit Diesel Engine Div. of General Motors Corp. for 236 Series 71 commercial engines.

The 390-hp engines will power the latest version of the M-107, the 175-mm self-propelled gun and the M-110 eight-in. self-propelled howitzer.

ENGLISH FORD'S PANEL VAN



Latest Thames panel van uses the Anglia 41-hp engine, four-speed gearbox and rear axle. It has a quarter-ton load rating and 73 cu ft of cargo space. Front doors have curved lower edges to clear high curbs when open.

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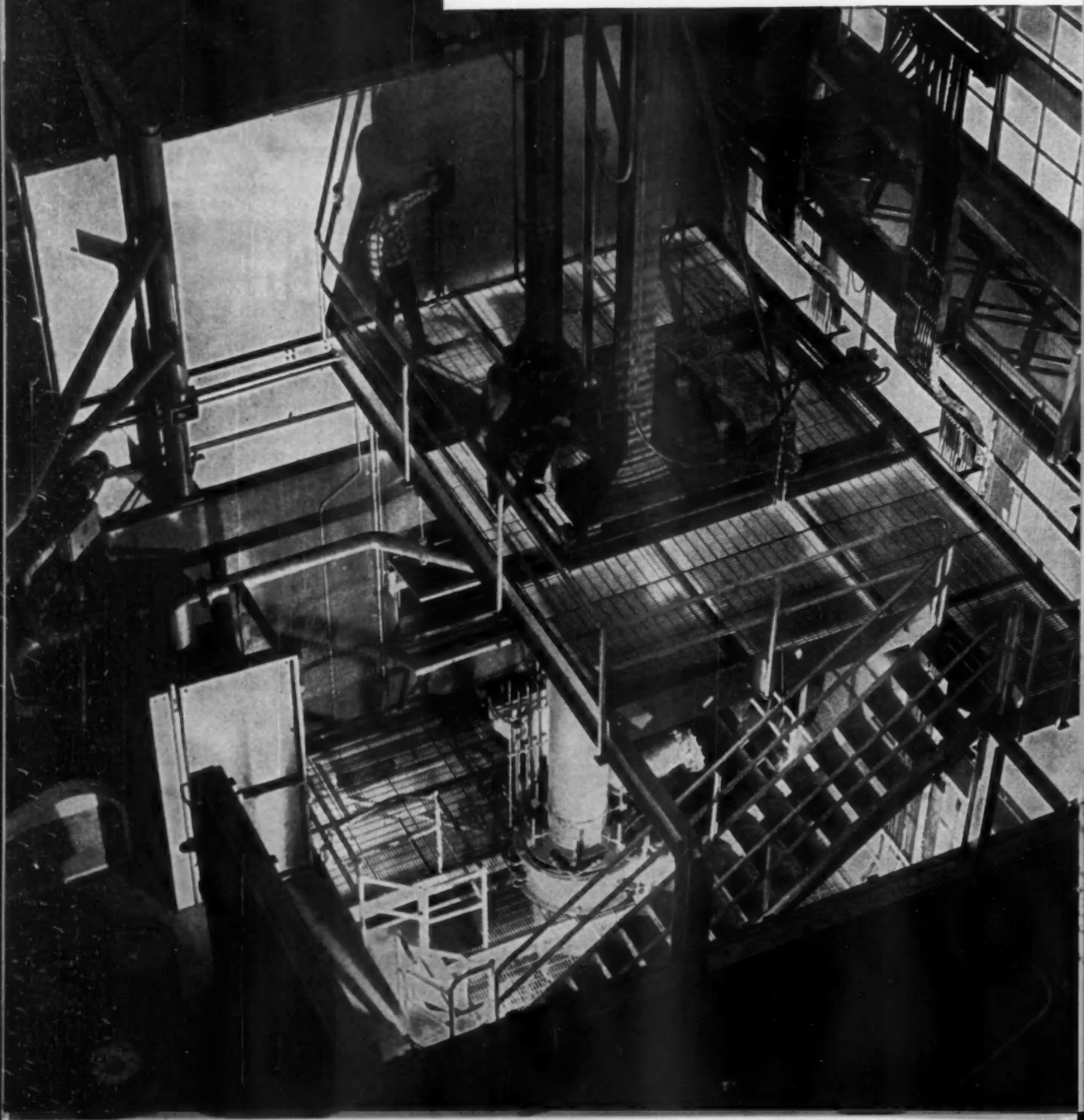
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In over 55 years, Holley engineers have tackled—and solved—many tough carburetion problems. One of the most frustrating has been carburetor flooding, caused by dirt particles found in the fuel supply which prevented steel or rubber-tipped needle valves from seating properly.

Holley engineers found the answer in a fuel inlet needle valve tipped with Viton*, a tough DuPont material with resilient properties that let the needle valve seat perfectly. More than two years of exhaustive testing have proved that the Viton Needle assures thousands of miles of trouble-free driving.

The Viton Needle is one more addition to a long list of design and development contributions which Holley has made to improve carburetion and ignition equipment for better car and truck performance.



Holley Carburetors and Ignition Equipment maintain the Holley reputation for precision, quality and dependable performance.

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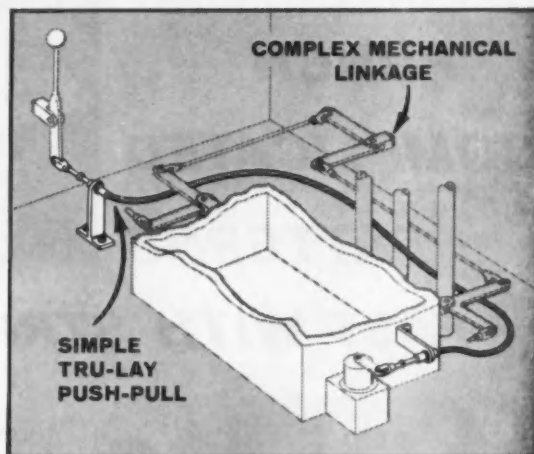
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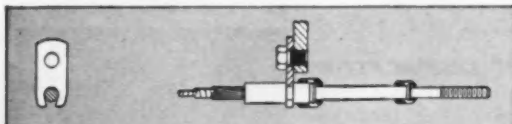
— with Tru-Lay *PUSH-PULL* Controls

If your products involve remote control—electrical, hydraulic, pneumatic or direct—TRU-LAY PUSH-PULL FLEXIBLE CONTROLS can help solve your design problems. They provide positive remote control over short or long distances—up to 150 feet from the control point. Because they operate while flexing, they can snake around obstructions. They will not buckle. They are ruggedly constructed, easily installed and operated, sealed against dirt and moisture, and will handle jobs with as much as 1,000 lbs. input. PUSH-PULL CONTROLS are simple, have but one moving part, are noiseless and give a lifetime of accuracy. Mechanical linkages, on the other hand, are complex. Unlike PUSH-PULL CONTROLS, they are made of many parts, wear at many points, and produce increased backlash, vibration rattles and lost accuracy.

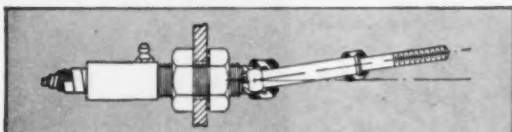


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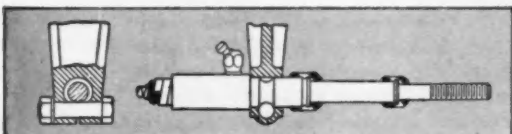
Anchorage



Clip anchorage • a simple clip for light loads

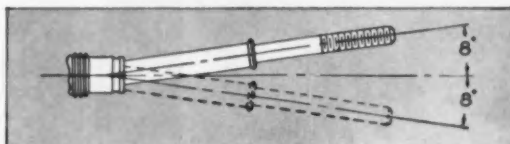


Bulkhead anchorage • for heavy-duty installations



Machined bracket anchorage • can be furnished for mounting any PUSH-PULL cable at the swivel terminal

Swivel Action



Standard assemblies have end fittings with a swivel movement of $\pm 8^\circ$ to compensate for misalignment and rise or fall of lever arms. Swivel joints, and the sliding ends, are sealed against dirt and moisture.

PUSH-PULL DATA FILE SHOWS HOW TO SIMPLIFY, IMPROVE DESIGN



• Write for your PUSH-PULL Data File. It contains a complete set of engineering bulletins which describe in detail the operation of PUSH-PULL CONTROLS, their applications, features and advantages.



PUSH-PULL CONTROLS

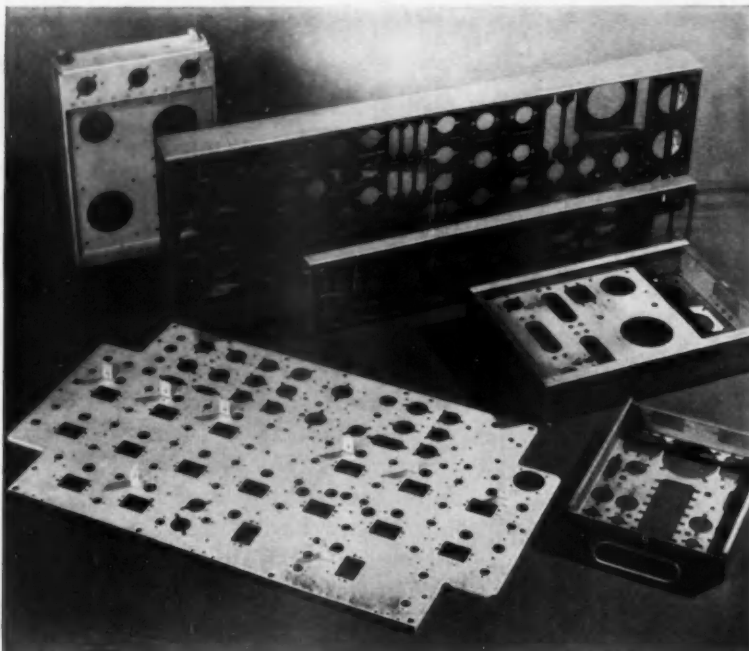
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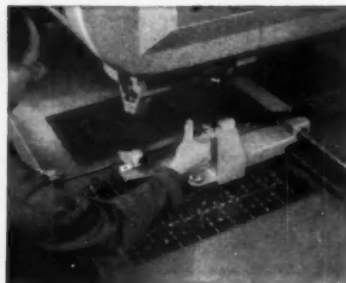
FAST WITH STRIPPIT FABRICATORS



SUPER 30. Handles flat or formed workpieces 60" wide...any length. Both the Super 30 and the 15A punch round and shaped holes up to 3½" diameter, to ¼" thick material...notch 90° corners—rectangular, radii, vee and special shape edge notches—up to ⅝" capacity...nibble straight line or contour shear up to 38" diameter circle, at 165 strokes a minute in ⅝" material.

STRIPPIT DUPLICATOR

For low cost production runs on the Super 30 or 15A, the STRIPPIT Duplicator functions like a pantograph to reproduce any hole pattern from a drilled or punched template. No custom dies needed to turn out precision sheet metal parts.



NEW 15A. Designed for workpieces up to 30" wide...any length...the new 15A Fabricator offers all the speed and accuracy of the Super 30. Each machine, with its own universal tool holder, makes it possible to interchange standard and special tools in seconds to minimize down-time. Flat punched parts produced require no deburring. Multi-stop micrometric gaging system positions work rapidly to exact layout specifications.

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In Canada: Strippit Tool & Machine Company, Brampton, Ont.; In Continental Europe: Raskin, S. A., Lausanne, Switzerland; In the British Isles: E. H. Jones (Machine Tools) Ltd., Hove, Sussex, England.

NEWS

FEATURES

Single-Leaf Spring Due Chevy's 114-In. Line to Have Innovation

Single-leaf springs, under development since the late 1930s, will appear on Chevrolet's new 114-in. wheelbase models when they are introduced in the fall.

Other General Motors divisions, Ford and Chrysler also are working on their own versions of single-leaf springs. If Chevy's spring wins public acceptance, the other manufacturers are expected to move speedily to produce their own units.

In the heavy duty truck field, the term "single-leaf" is not quite accurate, since two or three leaves are utilized. The extra leaves are placed some distance—three to six in.—from the outside of the axle to resist high torque caused by braking and acceleration.

Tested on Trucks

Rockwell-Standard Corp. has a number of customers testing its "Taper-Leaf" single-leaf spring on trucks and trailers on both front and rear axles. Several hundred Rockwell-Standard two-leaf versions of the "Taper-Leaf" are in use as suspension pieces for Rockwell's tandem axles.

Cost advantages of the single spring will not be too great for Chevrolet since only rear coil springs are replaced. Of all General Motors cars, only Corvette has leaf springs in the rear.

Savings in steel costs, however, would be considerable for a manufacturer switching from multi-leaf springs. Multi-leaf springs are used on all Chrysler, Ford and Studebaker-Packard models and on the Rambler American.

Another advantage of single-leaf springs is the weight saving, estimated at from 20 to 30 per cent on passenger cars and several hundred lb on large trucks.

Single-leaf springs on one military vehicle produced a weight saving of 162 lb while on four-spring tandem trailers, there was a 236 lb saving.

Other Advantages

Other advantages claimed by proponents of the single leaf are longer service life and better uniformity of performance.

The anticipated problem of vehicle control after spring breakage has been investigated thoroughly. High speed panic stops on curves and straightaways indi-

(Turn to page 49, please)

AUSTIN AND MORRIS PICK-UP



New pick-up offers carrying capacity of 75 cu ft for a payload of 1200 lb. Rearward positioning of 'B' series B. M. C. engine is claimed to result in excellent weight distribution.

AI TABLOID

A consolidation of data on fibrous materials research is presented in an Air Force research report. It lists information on sewability, friction, abrasion and weather resistance, porosity and air permeability, temperature properties and chemical resistance of different yarns, cords and webbing and fabrics.

* * *

A process for melting and casting beryllium ingots by electron bombardment is described in a Navy research report. Also available is an Air Force research report on the attempted synthesis of beryllium hydride.

* * *

Zinc is the most satisfactory metal in forming protective coatings for niobium and niobium alloys, according to a Navy report on protection of refractory metals for high temperature service.

* * *

Seventeen Atomic Energy Commission research reports on metallurgy, ceramics, and materials have been released to industry and the public.

* * *

A report on chemical reactions between tungsten and aluminum oxide believed to be a factor in the breakdown of indirectly heated vacuum tubes—and a summary of research on an Army fuel cell program have been released to industry and the public.

* * *

Progress in an Army project aimed at developing new types of non-oxide glass for missile use with higher melting and softening temperatures and improved thermal shock resistance is described in a final research report.

* * *

Forging characteristics, design limitations, dimensional tolerances, and quality-control problems on forgings made from martensitic steels heat treated to strengths up to 300,000 psi, are discussed in a report released to industry and the public.

Detection of fatigue damage in metals by ultrasonic means must be based on concentration of ultrasonic energy at the surface of the examined metal, a research report reveals.

* * *

X-ray projection microradiography as a metals testing technique is evaluated in an Army report. Also available are two Air Force reports on intermetallic compounds and diffusion barriers for refractory metals.

* * *

Aided by data obtained from satellites launched in 1959, and with certain arbitrary assumptions, a complete model of the upper atmosphere was constructed by a Soviet scientist. Another translation from the Russian describes sputniks and other artificial earth satellites.

* * *

The first of a series of standards for TFE-fluorocarbon resins, useful because of their unique physical, chemical and electrical properties, is being considered by the industry for adoption. The standard establishes requirements and methods of test for the material, dimensions, workmanship, and the physical and electrical properties of three grades of TFE sheet in minimum thicknesses of 1/32 in.

* * *

Machine techniques for gathering and reducing data from human response experiments are analyzed in an Air Force research report released to industry and the public.

* * *

A "Technical Resources Directory in Plastics"—published by the Dept. of Defense to encourage maximum communication between U. S. military agencies and the plastics industry—has been released through the Office of Technical Services, Business and Defense Services Administration, U. S. Dept. of Commerce.



A. B. Grisinger, veteran automotive stylist, has been appointed chief stylist for Lincoln-Mercury.

Hydrofoil Applicants

Twenty-eight companies seek to operate the first U. S. commercial hydrofoil passenger vessel now under construction.

The 104-ft, 80-ton craft will carry between 70 and 80 passengers at more than 60 knots.

Thomas E. Staken, Maritime Administrator and chairman of the Federal Maritime Board, said shipping companies, towing lines, engineering concerns and excursion lines are among those seeking to operate the vessel. The craft is being built by Dynamic Developments, Inc., a subsidiary of Grumman Aircraft Corp.

Dust Effects Studied

Southwest Research Institute, San Antonio, Tex., is studying the effects of dust on gas turbine engines in various parts of the world.

NEWS

FEATURES

CONTINUED

(Continued from page 47)

cate that a broken single-leaf spring has little effect on handling characteristics.

A scale model of a transverse single-leaf spring was built in 1943 after five years of research by a group of engineers at Standard Steel Spring Co. (Rockwell-Standard). It had uniform width and thickness.

In 1950, Nash Motors planned a 100-in. wheelbase series with single-leaf springs for rear suspension. There was insufficient chassis clearance at the spring seat, however, and the plan was dropped.

Then, in 1952, GM designed a single-leaf spring for Pontiac. Prices from spring suppliers were unfavorable and this program was cancelled.

Pinch Plasma Engine

Successful testing of a compact pre-production pinch plasma engine—third since 1958—was announced by Mundy I. Peale, Republic Aviation Corp. president.

Mr. Peale told shareholders at the annual meeting that the experimental engine has "proved its feasibility" during tests at Wright Field. Light weight and ability to operate over long periods of time are chief advantages of plasma propulsion, he explained. He added that Republic expected a contract to build a "flyable" production model.

Republic's backlog, he said, amounts to \$562 million with production of the F-105D, a supersonic fighter-bomber, scheduled through 1964. In addition, \$24.6 million was allocated in the current budget for further refinements in the F-105D

and a reconnaissance version of the craft is currently under study by the Air Force.

Since 1958, Mr. Peale said, Republic scientists and engineers have initiated studies and programs which have taken it into 29 new technological areas. These range from development of short take-off and landing aircraft and vertical rising models to lunar reconnaissance vehicles.

Ordnance Program

Since its inception two years ago, the Qualitative Development Requirements Information Program of the Ordnance Corps has awarded 28 contracts totaling \$2,066,369.

The program permits the exchange of information of mutual benefit, regarding current and future ordnance requirements for development of new items, components, materials or techniques.

During the last two years, more than 4000 problems on QDRI were given civilian organizations through meetings, briefings and correspondence.

New Rocket Engine

General Electric Co. has test-fired a new rocket engine that may narrow the gap between American and Soviet propulsion systems.

The engine, called a plug nozzle, developed more than 50,000 lb of thrust, G. E. engineers said. It can be scaled up to multi-million lb levels faster and cheaper than conventional propulsion systems.

The plug nozzle differs from conventional rocket engines in that it is only half as long and is shaped like a funnel.

TWO-SECTION GERMAN TROLLEY-BUS



New Henschel trolley-bus with light metal frame accommodates 170 passengers and is widely used in suburban West German areas. The two-section vehicle is 53 ft 6½ in. long, 11 ft 3 in. high and 8 ft one in. wide.



EUROPEAN ROUND-UP

By DAVID SCOTT • Special Correspondent

Armstrong Patents, Yorkshire, England, has announced a new self-contained suspension unit that combines a self-levelling air spring and hydraulic shock absorber. Requiring no external pump, reservoir or pipes, the bolt-on unit consists of a crank-operated piston with the cylinder and crankcase completely filled with oil.

Upper and lower flexible diaphragms contain the oil, and form air cushions within the housing for the main and rebound springs. Release valves in the cylinder head give damping action. Automatic height control is by a small plunger pump, actuated by a cam on the crank arm, that transfers oil from one side of the piston to the other as required.

British Resin Products has formulated a resin for foundry cores that incorporates a curing agent and is claimed to produce a wet sand mix that has a storage life of two months.

It is said to cure with a fine finish in a hot mold in one to eight minutes, depending on the complexity of the form. Called Cellobond, the preparation is said to be odorless and cheaper than most comparable resins.

Another British development, under study by one of the big car manufacturers, is an oil-floated

bearing working on the air-cushion principle. Oil under pressure supports the shaft, and the bearing is frictionless and has an infinite life.

New Casting Method

An advanced method for continuous casting of square-section steel billets at the same rate as quick-chilling flat slabs is revealed by the British Iron and Steel Research Association. The water-cooled copper mold has the profile of three or more linked diamonds that produce square billets joined at their edges that are later parted prior to rolling. The multiple mold gives more even heat dissipation and speeds crust formation.

Coating gas turbine parts for improved high-temperature operation is one of the current projects of the British Ministry of Aviation. Metals like tungsten and molybdenum, that oxidize at around 500 C, are coated with a 0.005-in. layer of corrosion-resistant nickel, beryllium, cobalt or iron alloys by sintering, spraying, rolling or electroplating. The composite material is stated to withstand temperatures up to 900 C without loss of mechanical strength.

Reduce Night Glare

Joseph Lucas in England is marketing equipment for dual-

intensity turn-indicator and stop lights to reduce night glare. The two-level system uses a triple-pole relay actuated when the lights are switched on. This inserts resistors in series with the bulb filaments, and shunts others across the direction indicator bulbs to provide a compensating load on the thermal flasher unit in order to maintain the normal interruption frequency. Redesigned lamp reflectors and lenses give higher daytime intensities with standard wattage bulbs.

English Ford has launched a panel van based on the Anglia, using the car's 35-hp ohv engine and four-speed gearbox. Its Consul II (now designated Consul 375) and Zephyr models now have disk brakes in front, and sealed beam headlights as standard equipment.

Other spot news from Europe: The Renault Dauphine has been selected by India as its "people's car" for local production, and the French company has offered to set up an assembly plant in 18 months.

Chrysler will build a \$1.4 million assembly plant in Syria with an annual capacity of 300,000 vehicles.

Millionth German Ford

German Ford recently turned out its millionth passenger car since operations at Cologne started in 1931. Current daily output is over 1000 units.

Dunlop will build a \$5.6 million tire factory in Nigeria.

Leyland has formed a new company in Portugal for local manufacture of its trucks, buses and Diesel engines.

B.M.C.'s bid to take over the Borgward company will, if successful, give Britain's biggest auto producer a strong position inside Germany and a springboard into the European Common Market.

Vauxhall (G.M.) is starting work this month on its new million-sq-ft factory at Hooton Park, Cheshire. It will make car and truck components. Earlier plans to transfer all truck manufacture from the main Bedford plant have been revised.

NEWS

FEATURES

CONTINUED

Turret Ring Assembly

The new concept of increased mobility, air-transportability and droppability in military vehicle design has led the Army far afield in its search for lighter materials than the conventional iron and steel.

The use of aluminum "skins" for vehicles is not a universally feasible solution since aluminum does not provide the protection required by the mission of certain armored vehicles. Therefore, designers have focused their attention on the internal components of tanks, armored cars, and gun carriers in efforts to reduce weight.

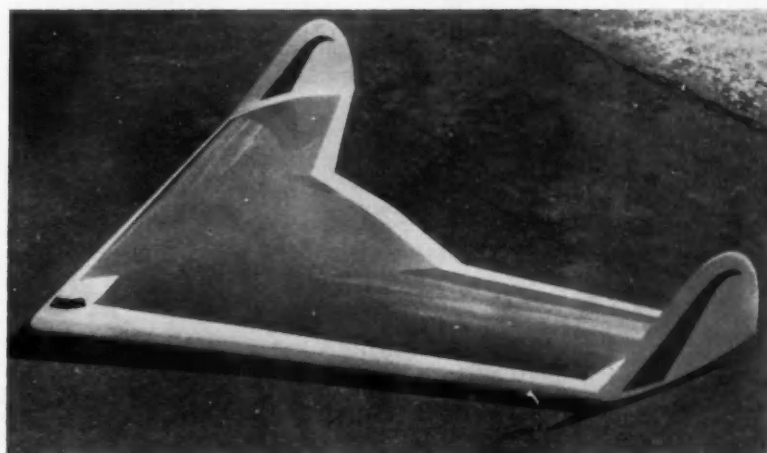
One item which offered a substantial cut in weight was the turret ring assembly in an existing self-propelled artillery vehicle. If a weight reduction could be realized in the turret ring assembly for this vehicle, the contemplated design and material could be projected for use in later vehicles.

As a result of a preliminary study in this area, the Ordnance Tank Automotive Command developed a light weight aluminum turret bearing for use with plastic balls. The aluminum used was 7075 Temper T6 and the plastic balls were made from a polycarbonate resin.

The bearing, which is approximately 80 in. in diameter, has successfully passed proof firing tests and is presently undergoing vehicular road tests to determine the durability and capability of the aluminum to withstand the loads imposed during travel.

If the road tests are successful, a 59 per cent saving in weight of the turret bearings will be realized and a whole new field for large aluminum bearings utilizing plastic balls will be opened.

DESIGN FOR \$31 ATLANTIC FLIGHTS



Model of design for all-wing 300-seat subsonic airliner by Handley Page Ltd. The firm says it could cut ocean fares to \$31. It has laminar-flow wing.

Plastics Exposition

Record crowds attended the Ninth National Plastics Exposition and Conference, sponsored by the Society of the Plastics Industry, Inc., in New York City. The week-long program of technical sessions, exhibits, panel discussions and committee meetings attracted leaders in the plastics world.

The feature address at the opening ceremonies in the Coliseum was made by Dr. Hugh L. Dryden, Deputy Director of the National Aeronautics and Space Administration. Symbolic of the space age role of plastics, a special dedication message was relayed by way of the Echo communications satellite.

More than 260 exhibitors displayed new materials, applications, and fabrication equipment on the three floors of the Coliseum.

Some 11 technical sessions occu-

pied plastics specialists at the Hotel Commodore. The conference offered a series of symposia covering such areas as automotive plastics, machinery, building, communications, packaging and defense products.

International flavor was added by the attendance of 1200 foreign industry executives and some 15 exhibitors from Canada, Great Britain, Germany, Italy and Switzerland.

S-P Truck Contract

Studebaker-Packard Corp. has been awarded a \$3.5 million contract for 646 2½ ton trucks. This is the third government contract awarded S-P in a month. Government orders since Jan. 1 to S-P total \$31.4 million.



*In the Lipe
Spotlight—*

V. Kap Trucking, Inc.,
Painesville, Ohio

*"Our costs are lower with
LIPE CLUTCHES ..."*

"Rolling a quarter-million payload miles a month really puts the pressure on our 54 tractors," reports Raymond Luhta, service manager for V-Kap Trucking, Inc., Painesville, Ohio.

"A performance check showed us that units with Lipe clutches were logging about 150,000 miles per clutch. Now our entire fleet (Whites, Fords and Internationals) is equipped with Lipe Clutches, either as original equipment or on a continuing replacement basis.

"As a result, our tractors are spending more time on the road and less in the shop."

Reasons like these — better mileage, more capital equipment use and lower maintenance cost — reveal why so many fleets are converting to Lipe Heavy-Duty Clutches. Make performance prove to you, too, that ...



LIPE DELIVERS IN THE CLUTCH

© LIPE — ROLLWAY CORPORATION, SYRACUSE, NEW YORK

MIEN

IN THE NEWS



Dodge Mfg. Corp.—John M. Macy has been promoted to assistant to the vice president - engineering.



Willys Motors, Inc.—Cruse W. Moss has been promoted to executive vice president.



Ex-Cell-O Corp. of Canada, Ltd.—George F. Howard has been named production manager.



Allis-Chalmers Mfg. Co., Construction Machinery Div.—George E. Hall has been appointed manager.



Bendix-Westinghouse Automotive Air Brake Co.—Edward W. P. Smith has been promoted to director of purchases.



Chrysler Corp., Amplex Div.—William R. Donnelly has been appointed president.

Vanadium-Alloys Steel Co.—A. R. Johnson and Daniel H. Yates have been named manager and assistant manager, Research Dept.

Waukesha Motor Co.—F. C. Schulze has been promoted to vice president-sales.

Purolator Products, Inc.—Charles J. Casaleggi and Theodore C. Sauer have been named staff engineers.

Motec Industries, Inc.—W. L. Pringle and Bert F. Whitbread have been appointed vice presidents.

Electric Autolite Co.—Phillip G. Robinson has been named administrator of corporate sales.

Chrysler Corp., Engineering Div.—David M. Borden has been promoted to chief engineer-automotive research.

W. R. Grace & Co., Polymer Chemicals Div.—Harry C. Haaxma has been named market development engineer.

U. S. Rubber Co.—William E. Wolstenholme has been appointed a senior research scientist.

Chicago Pneumatic Tool Co.—Guy J. Coffey has been elected board chairman and chief executive officer; Norman Readman has been elected president; Thomas F. Noonan has been named vice president and comptroller and Carra L. Lane was promoted to vice president and manager of plant operations.

Allis-Chalmers Mfg. Co., Special Products Dept.—Kenneth R. Geist has been promoted to general manager.

Fellows Gear Shaper Co.—William E. Milliken has been elected treasurer.

Industrial Rayon Co.—John W. Brownley has been appointed vice president-marketing.

Electric Autolite Co.—Spark Plug Div.—Kenneth C. Bell and Frank M. Kittredge have been named chief engineer and section engineer respectively.

Federal-Mogul-Bower Bearings, Inc.—Charles W. Williams (far left) has been appointed research director and Thomas G. Conway has been named Hartford plant manager.

Clark Equipment International, C. A.—J. Frederick Bechtel has been elected executive vice president and general manager.

Magnaflux Corp.—Bruce D. Tyler has been appointed director of non-destructive testing training courses.

Allis-Chalmers Mfg. Co., Special Products Dept.—Kenneth R. Geist has been appointed general manager.

General Motors Corp., Chevrolet Motor Div.—Henry J. Cawthra has been named supervisor of technical publications and instructions.

P. R. Mallory & Co., Inc.—Charles A. Barnes has been appointed administrative vice president.

Motec Industries, Inc.—James A. Miller has been promoted to vice president in charge of engineering research and development.

Solar Aircraft Co.—Marion J. Stock has been elected comptroller.

Necrology

Henry Butler Williams, 65, retired New York sales manager for Joseph T. Ryerson & Son, Inc., died June 26 in Verona, N. J.

John Alexander Douglas McCurdy, 74, aviation pioneer and the first man to pilot a flying boat, died June 25 in Montreal, Canada.

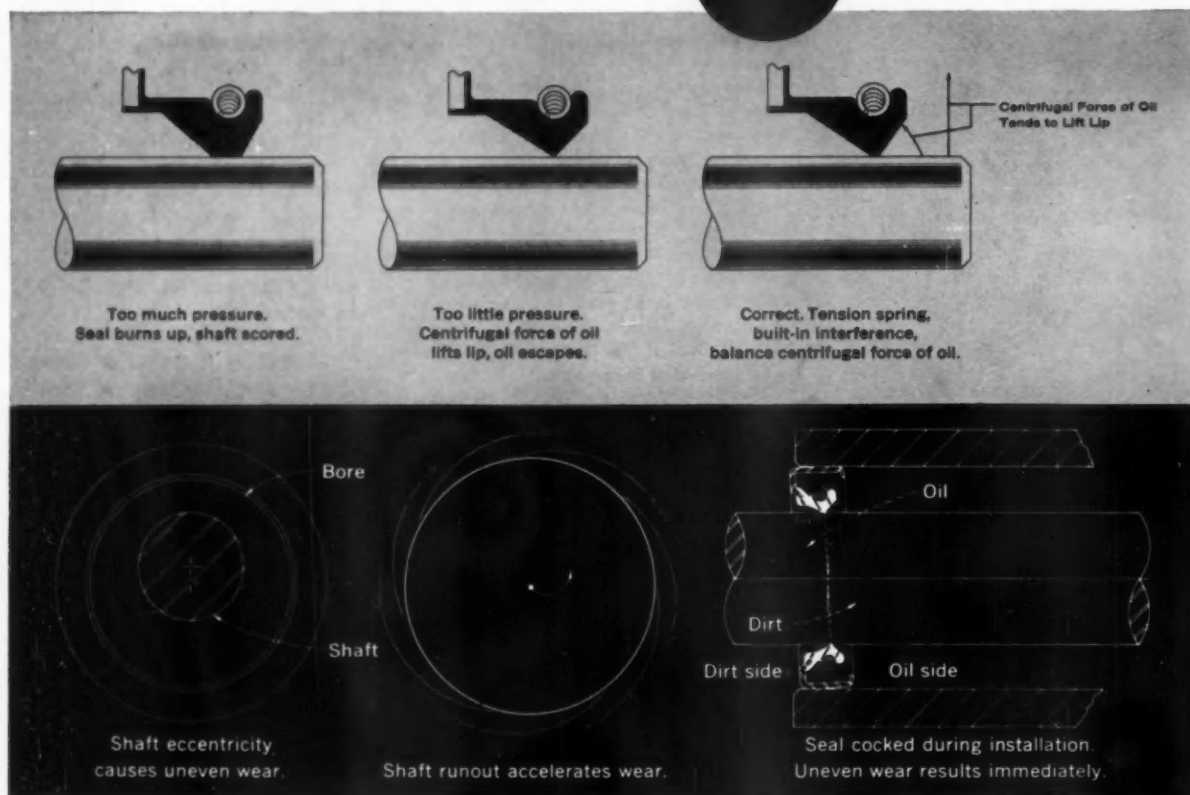
Claude M. Bigelow, 63, purchasing agent for Brockway Truck Co., died June 18 in Cortland, N. Y.

William J. Nattimore, 73, first Chrysler Corp. director of advertising, died June 17 in Detroit.

Roy B. Drago, 69, retired assistant plant manager of the Chevrolet Gear and Axle Div. of General Motors Corp., died June 17 in Racine, Wis.

Thomas Kenny, 65, retired sales engineer for the Midwest district of the Lipe-Rollway Corp., died May 28 in Park Forest, Ill.

Lip pressure...too much or too little,
and you've a leaker for sure!



Ideal sealing conditions are (1) shaft in bore center, (2) no runout, (3) seal not cocked, (4) seal concentric, (5) bore round and smooth, (6) shaft round and properly finished, (7) seal proper size.

Meeting these conditions is complicated, frequently requires special seal design or the specialized knowledge of National Seal engineers.

Sealing problems should be anticipated and answered on the board, not in production. Why not call your National Seal engineer now about your current project. He's in the Yellow Pages, under Oil Seals or O-Rings.



NATIONAL SEAL

Division, Federal-Mogul-Bower Bearings, Inc.

GENERAL OFFICES: Redwood City, California

PLANTS: Van Wert, Ohio; Redwood City and Downey, California

an Editorial



Getting Down to Brass Tacks

VERY SOON IT WILL BE clearly apparent to American Industry that automobile, bus, truck, tractor and engine manufacturers here have set the stage for a year of advances in 1962 product development seldom equalled in the history of the business. The results of these advances will be reflected in the increased sales and delivery of everything from machine tools to raw materials such as aluminum and stainless steel. Some machine tool builders already have moved from the doldrums to the "well booked up" stage because of automotive industry orders. More and larger orders now loom ahead. Machinery, equipment and supply manufacturers who fail to get orders in the next 12 months from the automotive industry will have only themselves to blame.

RECENTLY, A WELL KNOWN industrial executive called on me at my office in Philadelphia. He said, in brief, "you simply have to tell the automotive industries that they have to buy the products of our industry." I said, "Hold everything, friend. Who has to buy what and why? Maybe you ought to start thinking about doing some selling to this industry instead of expecting that everyone else will do your job for you without any effort on your part."

OF COURSE, THIS POINT OF VIEW was received with considerable disfavor. The idea of doing some "selling" is completely out of date. It is out of date even with a very large number of automobile dealers, especially in the towns where the dealers agree that they will permit no evening selling so that their social life will not be interrupted.

THE 1961 RECESSION WILL DO a lot of good if it will get some of the "brass class" of executives off of their duffs and out into the field. Among suppliers, the tales about the big sale made in 1955 are growing pretty thin to repeat to the 1961 salesmen. Too few top executives remember that the important question to ask now is, "How much of the business are we going to get during the 1963 program." Much of the buying for 1963 is being planned in the automotive industries now.

OBVIOUSLY, THE MACHINE TOOL BUILDERS and materials suppliers who are getting the orders for 1963 business are reluctant to tell their competitors that the way to get new orders is to get out into the field and go back to work really "selling."

Henry W. Barclay
Editor and Publisher

GASKET GAUGE VS. TORQUE RETENTION

Gasket thickness is one of several factors affecting retention of initial torque loads. New study indicates significance of minor variations in gauge.

E. M. SMOLEY

Research Physicist

Armstrong Research and Development Center

Significant variations in the torque retention of a gasket material result from relatively small changes in thickness. This is one of the conclusions of a general study of the torque-retention problem made at the Armstrong Research and Development Center.

Generally, this work confirmed the widely accepted idea that maximum torque retention is usually obtained by using the thinnest gasket possible. But

In the test, each different gauge of the material was bolted between steel flanges, and the assemblies were placed in an oven at 300° F. for 18 hours.

Torque was then re-measured while the flanges were still hot. The thinnest gasket (1/64") showed an exceptionally low torque loss of only 1/2 of 1%.

The torque loss rose to 39% for the 1/32" gauge. The loss for the 1/16" material was 68.5%.

lowers cost and minimizes extrusion problems.

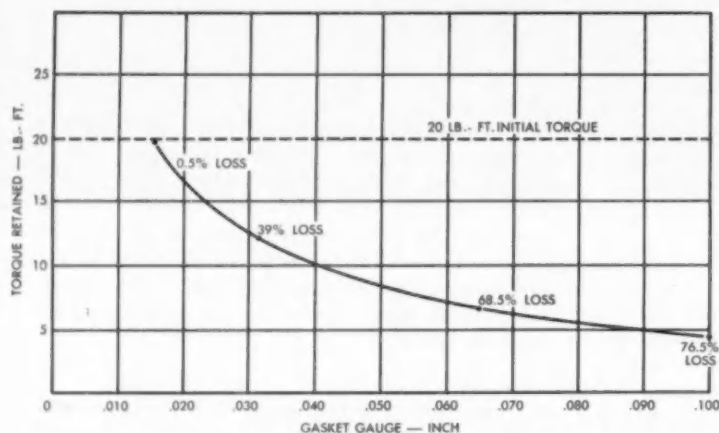
However, Armstrong engineers point out that there are mechanical factors that limit gauge reduction beyond a certain point. One is that, to provide a seal, gaskets must be compressed more than the cumulative deviation from perfect parallelism of the two flange surfaces.

For example, take a 1/32" gasket cut from a material capable of a 50% compression. If used where the cumulative inaccuracies of the flanges are more than 1/64", leaks will result. The alternatives are to use a thicker gasket, or a more compressible material.

Sheet metal or other lightweight flanges that permit bowing between bolts also work against the use of thin gauge gaskets. The bowing can sometimes be compensated by using a thicker gasket or a more compressible material. A more desirable alternative is to build more rigidity into the flange.

Gasket thickness is only one of many factors in gasket engineering that are under continuous study at the Armstrong Research and Development Center.

In the course of this work, we have built up a large library of data on gasket engineering. If you have a problem involving gasket design, selection, or performance, we may already have the answer. We will be glad to make suggestions if you will submit details to us. Write to Armstrong Cork Company, Industrial Division, 7107 Imperial Street, Lancaster, Pa.



In this test, four gauges of one beater-saturated asbestos fiber gasket material were put in steel flanges, with bolts torqued to 20 pound feet. The assemblies were heated at 300° F. for 18 hours; retained torque was measured while flanges were hot.

the magnitude of variation produced by changes in gauge was greater than had previously been estimated.

One phase of the study is charted above. In this curve, retained torque is plotted along the vertical scale, and uncompressed gasket thickness is indicated along the horizontal scale. The initial bolt torque was 20 pound feet for each of the gauges tested.

It is estimated that bolts at least 5" long would be required to eliminate most of the torque loss (76.5%) on the 1/10" material. Actually, 1" bolts were used in all these determinations.

In addition to these mechanical advantages, the use of thin gaskets also

Armstrong GASKET MATERIALS

John E. McIntyre
President, GIFS



GRAY IRON

Leaders Aid Automotive Progress

By John E. McIntire, President
Gray Iron Founders' Society, Inc.



FEW alliances have been as inevitable as the one between the automotive industry and the gray iron founders. From the first car ever built, the properties possessed by gray iron were tailored to many of the automotive industry's specific material needs. They still are. Through the years, this mutually-beneficial association has been essential to the growth of both of these great industries.

Today's conventional car uses about 500 pounds of iron castings, second only to steel as the most widely-used material in cars. The automotive industry is the largest user of gray iron castings, with close to 25 per cent of all miscellaneous castings going to the automotive industry.

Typical automotive parts made of gray iron include cylinder blocks, cylinder heads, crankcases, intake and exhaust manifolds,



OLD AND NEW BOARD OF DIRECTORS

Left to right (seated): Will H. Sanburn, Springfield Foundry Co., Indian Orchard, Mass.; R. Mayo Crawford*, Turner & Seymour Manufacturing Co., Torrington, Conn.; James Crowley, Pioneer Foundry Co., Inc., Jackson, Mich.; Donald H. Workman, Gray Iron Founders' Society, Cleveland, Ohio; Albert M. Nutter, E. L. LeBaron Foundry Co., Brockton, Mass.; John E. McIntyre, Sibley Machine and Foundry Corp., South Bend, Ind.; Cecil R. Garland, The W. O. Larson Foundry Co., Grafton, Ohio; Robert W. Wilder*, Elkart Foundry & Machine Co., Elkhart, Ind.; Paul H. Scherf, Alten Foundry & Machine Works, Inc., Lancaster, Ohio; Paul W. Kluge, Tower Grove Foundry, St. Louis, Mo. Standing (left to right): Curtis C. Williams, Jones, Day, Cockley & Reavis, Cleveland, Ohio; J. Tom Boyd, Goldens' Foundry & Machine Company, Columbus, Ga.; William G. Butler*, Golden Foundry Co., Columbus, Ind.; Robert F. Pohlman, Pohlman Foundry Company, Inc., Buffalo, N. Y.; J. Douglas James*, Urick Foundry Co., Erie, Pa.; Hermann P. Good, Textile Machine Works, Reading, Pa.; Austin B. Sayre, American Abrasive Metals Co., Irvington, N. J.; John C. Long, Atlas Foundry & Machine Co., Tacoma, Wash.; Walden G. Greenlee, Greenlee Foundry Co., Chicago, Ill.; Robert E. Crowe, Crowe Foundry Limited, Hespeler, Canada. *Retiring from Board



SECRETARY—GIFS

J. Tom Boyd

Vice President and General Mgr.
Goldens' Foundry & Machine Co.
Columbus, Ga.



VICE PRESIDENT—GIFS

Cecil R. Garland

Vice President, Secretary-Treasurer
The W. O. Larson Foundry Co.
Grafton, Ohio



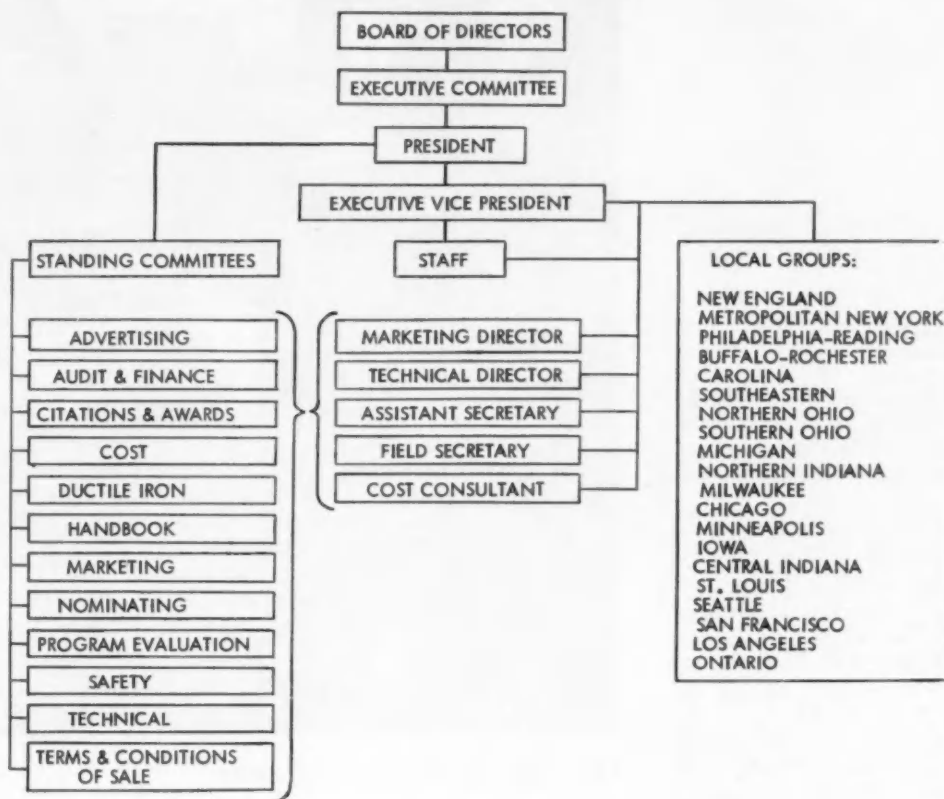
TREASURER—GIFS

Paul H. Scherf

Executive Vice President
Alten Foundry & Machine Works, Inc.
Lancaster, Ohio

GRAY IRON FOUNDERS' SOCIETY, INC.

ORGANIZATION CHART



piston rings, clutch plates, oil pump bodies, gear boxes, clutch housings, brake drums, flywheels, cylinder liners, transmission cases, differential carriers, water pump impellers, valve guides, master cylinders, brake cylinders, power steering cylinders, camshafts and air conditioning compressor bodies and parts.

The volume of gray iron castings consigned to the automotive industry becomes even more significant when you consider that the gray iron industry is the second largest branch of the entire metal-producing field. Gray iron foundries produce over 1 million tons of castings a month on the average, or 75 per cent of all castings, by weight.

In addition to those castings for end-product use by the automotive industry in cars, trucks, and buses, there is an untold quantity of castings used by the industry in its processing equipment. More than 80 per cent of the weight of all machinery and machine tools is of

the gray iron family. The automotive industry also uses huge quantities of cast iron dies and fixtures in production.

Advantages of the Casting Process

THE casting process provides more design freedom than any other forming method. Castings can be produced readily in almost any size, shape, or complexity. In fact, some designs to be practical can only be produced as castings. The only limitation is the ability to produce the shape needed in the wood, plaster, or metal form used as a pattern and even this can be made in more than one piece. The process is so flexible it permits the use of passages, undercuts, and curved reflex contours not possible with other high-production processes.

Because of the nature of the castings process, the optimum

amount of metal can initially be placed exactly where it's needed to meet strength and other requirements, and omitted where it is not required. Combined with ability to core out unstressed sections, this gives appreciable weight savings. Final shape is not restricted to the assembly of preformed pieces, or governed by limitations of other forming processes.

This design freedom enables the designer to obtain a very intricate part in a single piece. An engine block, with its involved outer shape and number of intricate internal passages, is an obvious example of combining a group of normally independent elements into a single integral casting. Furthermore, the gray iron engine block has superior qualities of rigidity, vibration absorption, corrosion resistance, wear resistance, and resistance to fatigue.

Another benefit is quality assurance, as a single integral casting

is a safeguard against the possibility of costly assembly errors, such as mismating of parts. Once dimensions for a one-piece casting are established as correct, duplication is automatic.

By using the shell mold process, castings can be made to close tolerances, averaging 0.005 inch/inch, thereby reducing machining costs and keeping metal wastage to a minimum.

Why Gray Iron?

WHAT are some of the outstanding properties of gray iron that have gained its widespread acceptance throughout the automotive industry?

First of all, molten gray iron has the highest fluidity of any ferrous metal, making it ideal for intricate and thin-walled castings. Its high fluidity is largely due to the unique fact that iron can be easily heated to and poured at temperatures that are as much as 700 or 800 deg. above its normal melting point. Furthermore, this super heating actually improves rather than harms the metal.

Secondly, it has low solidification shrinkage. Depending on composition, this solidification shrinkage varies from 0 to 1.9 per cent. Comparable shrinkage for steel or malleable iron is about 5 per cent and for aluminum from 2.8 per cent to 6.6 per cent.

These two factors—high fluidity and low solidification shrinkage—make it easier to get sound castings in intricate shapes and to close tolerances.

Another desirable property of gray iron is that it offers the widest choice of strength and hardness in the as-cast condition of any metal: Tensile strength from 20,000 to 60,000 psi and BHN from 120 to over 400. In addition to these properties, the newest member of the cast iron family, ductile iron, offers high strength combined with the ability to be bent or formed. In several respects ductile iron combines the engineering properties of steel with the manufacturing advantages of gray iron. This has led to its



THEY SAID IT COULDN'T BE DONE

. . . . but here they are. Striking example of the improved techniques and facilities for producing gray iron castings is the automotive valve guide which is cast at Sibley Machine and Foundry Corp., South Bend, Indiana, without a draft or taper. GIFS President John E. McIntyre (left) looks on as E. J. Hardig, Vice President and Chief Engineer, Studebaker-Packard Corporation, examines several of the valve guides. For many years engineers claimed draft couldn't be eliminated from these guides. Produced in high quantities, these taperless guides are lighter, have less finish stock, cost less to ship, less to machine, less to grind (can be ground in one pass on a centerless grinder); and, because there is no taper to cope with, assure more consistent finished machined parts.

wide use for automotive crankshafts.

The average gray iron is readily machinable. This is partly due to its contained graphite which helps break up chips and greatly reduces tool wear. A gray iron casting often can be roughed and finished in a single cut, normally impossible with other cast metals.

Gray iron also meets the automotive industry's rigid demands for dependability through its lack of notch sensitivity. This means that keyways, grooves, and other stress raisers are not critical in

rotating or oscillating parts made of gray iron.

There is no question that the economy of gray iron, compared to other materials has contributed greatly to its wide use throughout the automotive industry. Economy is realized both by savings inherent in the casting process and by the fact that gray iron is essentially a low-cost raw material. It is more economical than other ferrous castings because it can be melted in the highly-efficient cupola furnace. And, gray iron has a higher yield of finished castings per ton

of molten metal because of its low solidification shrinkage.

Recent Developments

TODAY'S automobiles are so vastly superior to those made 30 years ago that you can't begin to compare them. Neither can you compare today's vastly - superior gray irons with those of 30 years ago. And yet, too many design engineers fail to recognize the significant technical improvements made in this metal. Correcting this misconception is another goal of the GIFS educational program.

The traditional skill of the foundryman and the inherent advantages of the casting process have been supplemented in recent years by these major developments in the industry:

- Modern metallurgy has provided irons in a wide range of mechanical and physical properties, with the new ductile irons providing tensile strengths of more than 100,000 psi.

- Improved materials and new molding techniques make it possible to produce castings with a better surface finish and closer dimensional accuracy.

- Instrumentation and control in all phases of the operation have resulted in consistent quality.

- An increasing number of foundries have engineers who are capable of advising on design and producibility.

Ductile Iron

THROUGH modern metallurgy, the original gray iron has been developed into a whole family of high-carbon casting alloys. This family not only includes a series of gray irons with a wide range of properties, but also includes white irons, high alloy irons, and ductile irons.

Some of the properties of ductile iron are more characteristic of steel than they are of traditional gray iron, and this new metal is sometimes considered apart from gray irons. However, ductile iron castings are generally produced with the same facilities used to produce gray iron castings.

The automotive industry was quick to recognize the advantages of ductile iron. For example, one manufacturer realized substantial savings by using an automobile

bumper die made of ductile iron. The 32,000 pound die, which serves as the bottom die in a 1600 ton press, is cast integral with the shoe. Actual savings amounted to \$40,000.

A recent trend in specialization among foundries has provided facilities for specific types of castings. More than 100 GIFS member foundries specialize in automotive castings. Nearly 80 others specialize in the dies, jigs, and fixtures so widely used by automotive manufacturers. Some are best equipped for high rates of production, while others can more effectively turn out single or experimental castings.

Another trend in the modern foundry is the expansion of services. Many foundries are helping with casting design, making trial castings, specifying the pattern equipment, and recommending the proper heat treatment, if any is necessary.

Some foundries are equipped to give castings a comprehensive inspection, special finishing, and preliminary machining or targeting in a locating fixture to provide an accurate set-up for machining.

(Continued on next page)



Customer Engineers and Purchasing Agents attending one of the Society's 29 Regional Casting Design Clinics



The Society's Technical Director (left) demonstrates at a design clinic the use of the strain gauge as an assist in proper casting design

Current GIFS Activities

FROM its modest beginning, the Gray Iron Founders' Society has grown into one of the largest manufacturing trade associations in America, with nearly 400 members. Its offices are in the National City-East Sixth Building, Cleveland 14, Ohio. It is governed by an elected board of directors, with each director representing one of the 13 geographical districts in

the United States and Canada. These districts are further broken down into 20 local groups, each of which elects a group chairman and other officers.

To assist the board of directors in formulating programs and policy, these standing committees were set up: Advertising, Audit and Finance, Citations and Awards, Cost, Ductile Iron, Handbook, Marketing, Nominating, Program Evaluation, Safety, Technical, and

Terms and Conditions of Sale.

The following GIFS staff members work closely with the board of directors and the standing committees: Donald H. Workman, executive vice president; Charles F. Walton, technical director; Richard C. Meloy, marketing director; William M. Caldwell, assistant secretary; and Ben Imburgia, field secretary.

It is largely through the cooperative efforts of the staff and the committees that these typical activities are generated:

● **Technical** Through its technical activities, the Society strives to achieve better casting design techniques, product improvement, and lower costs. It offers consultation service for both foundries and customers and cooperates with other technical societies in establishing gray iron specifications. For example, Charles F. Walton is a member of the Iron and Steel Technical Committee of the Society of Automotive Engineers, the group which writes the SAE specifications for iron and steel. He is also secretary of American Society for



ASST. SECRETARY—GIFS
William M. Caldwell



FIELD SECRETARY—GIFS
Benjamin J. Imburgia



TECHNICAL DIR.—GIFS
Charles F. Walton

Testing Materials Committee A-3 that is responsible for ASTM specifications for gray and ductile irons. In addition to its well-known Gray Iron Castings Handbook, the technical department publishes technical manuals, articles for design engineers and purchasing agents, and disseminates other iron castings data for members and castings buyers.

● **Marketing** The marketing department, under the direction of Richard C. Meloy, is constantly seeking new uses and markets for gray iron, and interprets effective ways to develop, cultivate, and sell these markets. The department conducts customer design clinics, customer and foundry surveys, marketing seminars, and member sales training clinics. It compiles up-to-date statistical data, including shipments of casting, unfilled orders, injury frequency rate, productivity, operating rates, and annual earnings surveys.

Emphasis on Education

GIFS always has carried on an energetic educational program, both for its members and for users of gray iron castings. This program was given a powerful stimulant in 1958 when, at the Society's



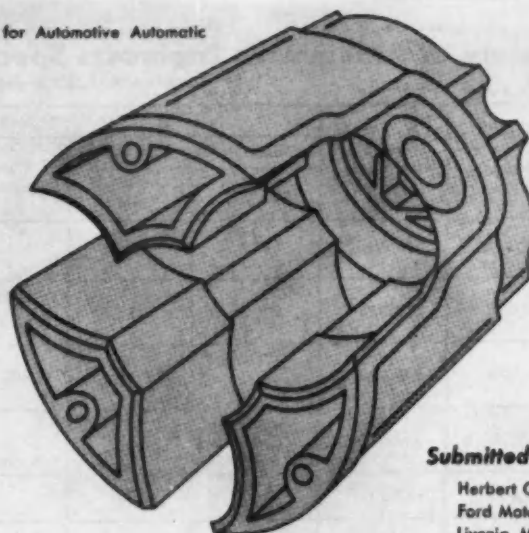
EXEC. VICE PRESIDENT—GIFS
Donald H. Workman

30th annual meeting, a topic for discussion was "Implications of the Aluminum Engine." Key participants in the discussion were two top engineers from General Motors Corporation, Dr. R. T. Thomson and D. F. Caris.



MARKETING DIR.—GIFS
Richard C. Meloy

Gear Carrier for Automotive Automatic Transmission



Submitted by:

Herbert C. Lazarus
Ford Motor Company
Livonia, Michigan

PROBLEM AND SOLUTION . . . GEAR CARRIER

Problem of this part was this: Strength requirements were not being successfully met with SAE 322 Aluminum Alloy Carrier. Solution arrived at, was as follows: At no extra cost, a 50 per cent stronger carrier was made by a simple specification change to ductile iron. Deflection of the part was almost halved and this resulted in two outstanding improvements in operation: Gear noise was reduced and gear life increased.

Later, a series of one-day regional design clinics was conducted from coast to coast for design engineers and buyers to give them valuable information on designing and specifying castings.

Each clinic featured talks on basic metallurgy and engineering properties. The various casting processes were explained, and the engineering and cost advantages of each were discussed. Another topic was the design of castings, stressing new design concepts for the engineer. The men also were given seven cost-saving suggestions in the field of specifying and purchasing castings.

So far, 29 of these clinics have been held, and they have been attended by 901 men representing 453 customer companies. Because of this enthusiastic reception, many foundries supplemented the clinics by holding similar ones of their own for groups of customers.

What's Ahead?

LOOKING to the immediate future, GIFS plans to continue its

Society of Automotive Engineers Specifications for Gray Iron Castings (Properties in 1.2 in. diameter test bar)

Spec. No.	Min. Tensile Strength psi	Brinell Hardness	Other Requirements				Typical Applications
			Transverse Test—18" Span		Total Carbon	Micro-structure	
			Strength Min. Lbs.	Min. In. Deflection			
110	20,000	187 Max.	1800	0.15			Miscellaneous soft iron castings in which strength and microstructure are not of primary consideration.
111	30,000	170-223	2200	0.20			Small cylinder blocks, heads, pistons, clutch plates, oil pump bodies, gear boxes, clutch housings, lightweight brake drums.
113	30,000	179-229	2200	0.20	3.4% Min.	Note—*	Brake drums and clutch plates for moderate service requirements where high-carbon iron is desired and heat checking is a problem.
114	40,000	207-269	2600	0.27	3.4% Min. Mandatory	Note—**	Heavy duty drums and clutch plates where both strength and resistance to heat checking are definite requirements.
120	35,000	187-241	2400	0.24			Automotive cylinder blocks, heads, flywheels, cylinder liners, pistons.
121	40,000	202-255	2600	0.27			Truck and tractor cylinder blocks, heads, heavy flywheels, tractor transmission cases, differential carriers.
122	45,000	217-269	2800	0.30			Diesel engine castings, liners, cylinders, pistons, and heavy parts in general.

* The graphite shall be of type A, size 2 to 4 (see ASTM-A 247 Evaluation of Microstructure). The matrix shall be lamellar pearlite. Ferrite, if present, not to exceed 15%.

** The graphite shall be type A, sizes 3 to 5 (see ASTM-A-247 Evaluation of Microstructure). The matrix shall be of fine lamellar pearlite with free cementite, free ferrite, or both to not exceed 5%.

prime objective of progressing with the times and responding to the current needs of the industry it serves. The vastness of the industry, and the many different types of foundry operations involved, makes the Society's job a continuing challenge.

The Society will carry on the work which has seen an ever-increasing number of progressive foundries adopt modern management and operating techniques. In addition to using more mechanization and up-to-date casting methods, these foundries are utilizing sound marketing principles and are taking advantage of the many aids being furnished to them.

The area of greatest concentration for the Society will be to explore fully the vast potential uses of gray iron. The many recent technical developments in the industry have offered a new range of engineering properties to provide better products at lower ultimate cost to the consumer. These developments have greatly enhanced the possibilities of increasing the use of gray iron in present markets, and in discovering untold new uses in markets now being explored.

Automotive Study Planned

THIS exploration is being done through a vast technical-economic study. This ambitious study, which just recently began, is being conducted by Batelle Memorial Institute, thanks to a grant made to the Society by the Committee on Merchant Pig Iron of the American Iron & Steel Institute and the merchant pig iron producers of this country. Among the first industries to be studied is the automotive industry.

The first stage of this study will be primarily of a technical nature, and is expected to take about a year. It will uncover data which will indicate the most urgently needed measures to be taken to stimulate greater usage of gray and ductile iron castings. The study will show where the future potentials lie and will help both foundrymen and their customers plan for the years ahead. ■

Chrysler's Enforcer

Chrysler Corp. has developed a new special purpose four-door sedan, the Enforcer, for police use. It mounts a 325 hp, 383 cu in. en-

gine on a 122 in. wheelbase.

Special heavy-duty components are offered as standard to meet the special requirements of highway patrols. These include a 40-ampere alternator, 12 in. fade resistant type brake drums, manual shift transmission, front seat springs with 2½ in. thick foam padding, solid vinyl headliner, and rubber floor mat.

The standard Chrysler unibody is beefed up by heavy-duty torsion bars, rear leaf springs, and shock absorbers.

More Mutts Ordered

Ford Motor Co. has been awarded a \$24.3 million Army contract for 7524 M-151 quarter ton utility trucks.

The award completes funding for 3147 vehicles ordered in January and provides for 4350 additional vehicles, bringing the total contract dollar value to \$28.8 million.

The vehicles are being assembled at the Livonia, Mich., transmission plant. Nearly 200 companies, mostly in Michigan, provide materials for the vehicle, known as the Mutt.

The contract assures 3500 jobs in Michigan until at least May, 1962.

Plastics

in the AUTOMOTIVE INDUSTRIES

... PART II ... EPOXIES

By
Norman M. Lloyd
MARKETS EDITOR

THE following article represents the second part of a series of special reports on plastics—what they are, and how they are being used by the automotive manufacturing industries. An attempt has been made to present the information in understandable, semi-technical language for the benefit of those having a specific interest in plastics as engineering materials.

—Part I—Nylon—appeared in the April 1st issue of **AUTOMOTIVE INDUSTRIES**

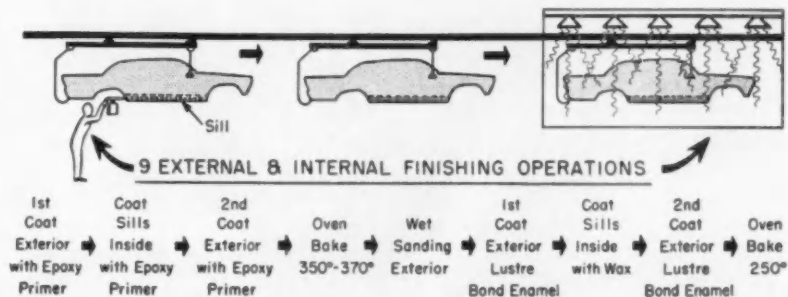
ALTHOUGH epoxies are threatening to become the master of several fruitful markets, their impact on the automotive industry has resulted in a great deal of materials re-assessment and a respectable amount of progress.

They are rapidly replacing their machined metal counterparts as prototypes, short-run dies, jigs, and inspection fixtures. As adhesives, they have left an indelible mark in the joining and fastening market, and are also being advanced as corrosion fighters in the form of primer coatings.

But before the epoxymakers can move to the head of the class, they will have to accelerate their technical assistance programs, and get into the shop with more useable data on properties, material standards, methods of test, environmental conditions and recommended uses, . . . and then back them up.

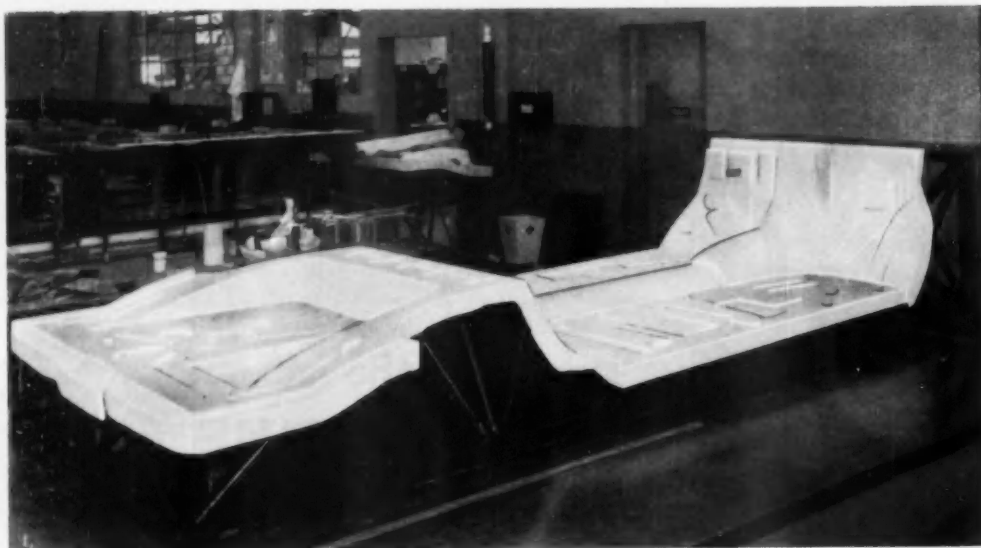
They will also have to warm to the basic objective of the automotive engineer, . . . reasonable cost in terms of mass unit production and demonstrable performance.

Real bright spot, however, is the market potential. Watching it, one can't help but get the feeling that the feature picture has not yet begun, and that we are still watching the travelogue.

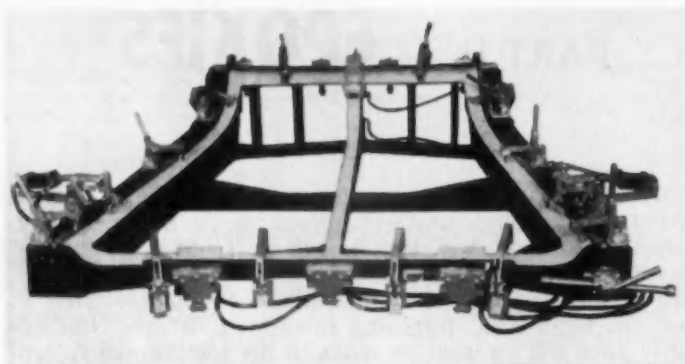


CHRYSLER CORPORATION'S UNIBODY CORROSION PROTECTION

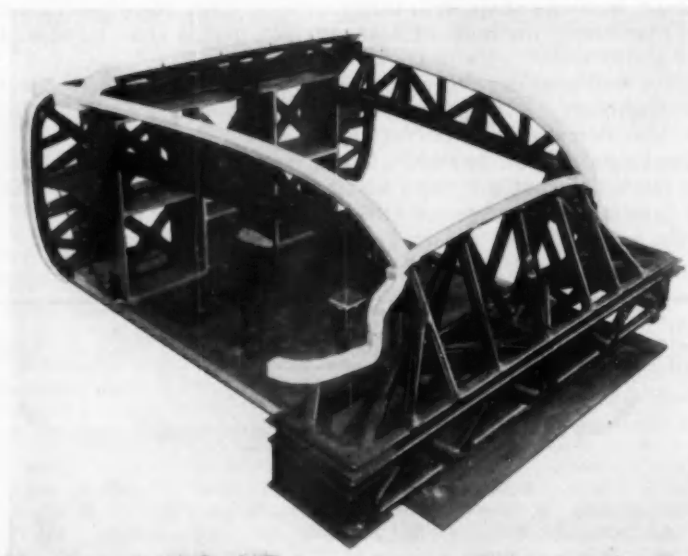
Chrysler's nine-step corrosion-protection finishing operation includes one interior and two exterior coats of epoxy primer.



Laminated epoxy floor pan master die model duplication is strong, light-weight and dimensionally stable. (Ren Plastics)



Surface cast epoxy face hood welding fixture was delivered in 2 weeks at a cost under \$2500. Previous method and materials cost \$10,000 and job took 8 weeks. (Ren Plastics)



Completely fabricated of epoxy laminating resins, glass, cloth and tubing, this fixture, designed to check overall front end alignment, cost \$2500. Former cost, using conventional materials was \$18,000. (Ren Plastics)

Chemistry—Epoxyes are liquid or solid polymers that, in a very general way, become tough, infusible solids upon the addition of a hardening agent.

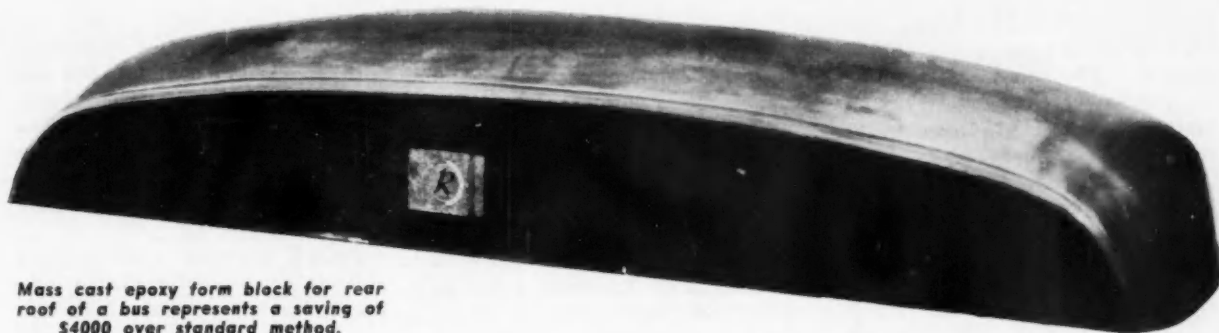
Most commercial resins are produced from a derivative of coal tar (bisphenol-A) and from an intermediate product formed during the manufacture of synthetic glycerin (epichlorohydrin). Varying the concentration of these basic ingredients determines the form of the resin—liquid or solid.

Increasing interest is also being shown in other types of resins that exhibit a greater resistance to heat.

- novolac type — made from epichlorohydrin and a substitute for bisphenol, called novolac
- peracetic type—produced by the epoxidation of various unsaturated fatty materials or petroleum derivatives

Basic epoxy resins are thermoplastic, and have no commercial value until they are "cured" by the addition of an activator, sometimes referred to as a catalyst, converter or a hardening agent. These agents, which transform the resin into thermosetting materials of high chemical and thermal resistivity, are generally amines or organic anhydrides and acids. They are grouped by (1) room temperature hardeners, and (2) high temperature or baking hardeners.

Use is made of the chemical



Mass cast epoxy form block for rear roof of a bus represents a saving of \$4000 over standard method.

reactivity of both the epoxy and hydroxyl groups. The epoxy group, or ring, is a triangle of atoms with an oxygen atom pro-

jecting— O — $\text{H}_2\text{C} - \text{CH} -$. It is opened by a number of products which contain one or more reactive hydrogen atoms (amines, acids, phenols, alcohols and thiols) to produce larger molecules with secondary hydroxyl groups. These, in turn, join with fatty acids, phenolics, anhydrides and epoxies in other polymers to increase the molecular weight of the polymer.

This reaction creates a unique cross-linking of molecules to form an interconnected, three-dimensional network that resembles a fish net. Cross-linking of the resin with the hardener is referred to as functionality.

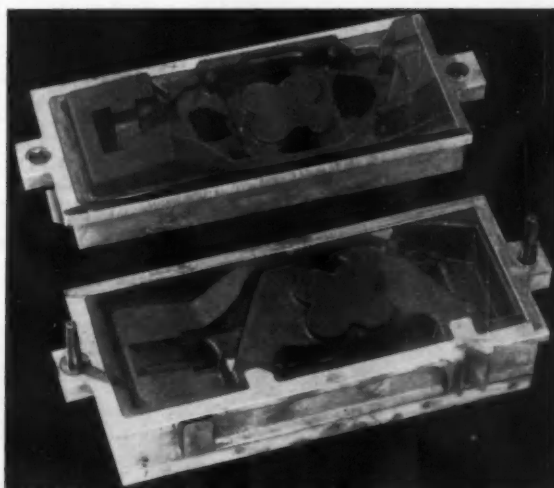
During the cure, heat is generated (exotherm), which raises the temperature of the resin and in turn, increases the cure rate. Care must be exercised not to exceed

the "limiting" temperature, above which the process decays and the strength of the resin is impaired. In some cases, the resin will actually carbonize under extreme conditions.

Additives and Modifiers—Since the cured epoxy most often does not provide all the properties

needed for a specific job, other ingredients are added to the recipe by a formulator to modify and improve performance.

Unmodified resins are normally brittle and unable to "give" under impact. To improve elasticity, without decreasing toughness, chemical additives known as flexibilizers are used. Most common



Surface cast blow core box eliminates finishing and hand barbing operations. (Furane Plastics)

Standard Ford station wagon is converted to a custom ambulance in the Shop of Siebert, Water-ville, Ohio. Fiberglass-reinforced epoxy roof mold was made at a fraction of steel metal die cost.



approaches are liquid polysulfide rubbers (Thiokols), thermoplastic polyamids (Versamides), and amines such as (Cardolite), (Lancast), and (Duomeen).

Diluents, such as allyl glycidyl ether and phenyl glycidyl ether, are often used to reduce viscosity and improve flow and wetting characteristics of the resins. Used in small doses, diluents inhibit cross-linking or chain-building potential and generally lower the heat distortion temperature and hardness.

Fillers are just what the name implies. They are used primarily to reduce cost by filling the resin

with inexpensive materials such as sand, calcium carbonate and various metal powders. By hindering the contact and expansion of resin molecules, fillers also provide additional bonuses in lower heat reaction, "limiting" temperature, and reduced shrinkage.

To prevent running and flow on vertical and inclined surfaces, thixotropic agents thicken or gel the resin temporarily. Disturbing or mixing the resin will break the gel, however, and the resin can be again applied freely. Most common agents are silicas and silicates, although such materials as chopped fibers have been used with success. Biggest drawback has been cost, which approaches that of the resin.

Resinous modifiers in the form of phenolics, ureas, polyesters, vinyls, silicones, furanes and

others, are sometimes "alloyed" with epoxies to combine the desired properties of each basic resin. In a true sense, these modifiers are not additives, since they react chemically and cross-link with each other to produce new resins.

Fibers, matting and chopped strands are used for strengthening and reinforcement. Although a variety of synthetic, mineral and vegetable materials are used, glass and metal fibers enjoy the greatest commercial acceptance.

Glass, strong and light weight, is available in any number of filament sizes, patterns and weaves, and can be obtained pre-impregnated with resin.

Metal fibers such as steel and aluminum provide greater heat and abrasion resistance and thermal conductivity.

Reinforcements, with fat markets in automotive tooling and laminating, are directly responsible for widening markets in piping, aircraft and missile components, pressure vessels, structural applications and chemical and ventilating equipment.

Properties—The actual tests of a typical resin, well cured, in its pure state are:

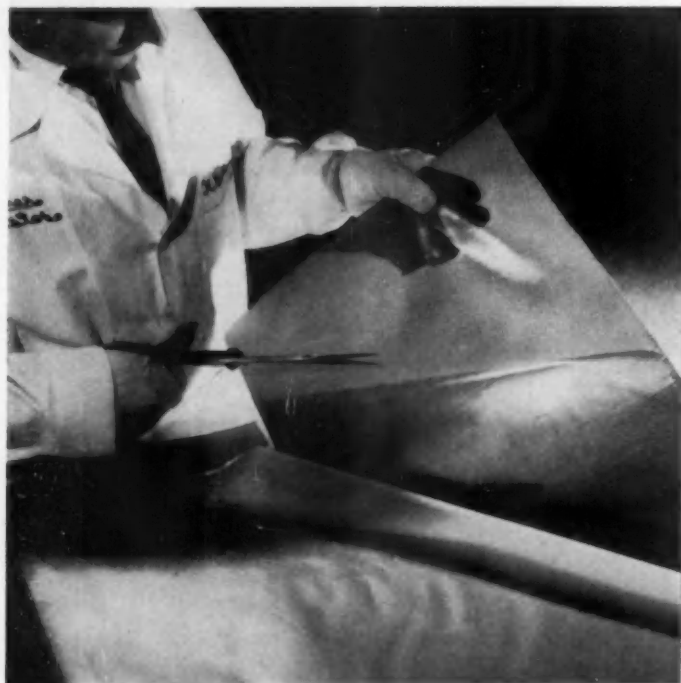
Tensile strength	12,000 psi
Compressive strength	17,000 psi
Flexural strength	20,000 psi
Impact strength	0.5 Izod
Heat distortion point	160 F

(New high heat epoxies are available which allow post curing of finished tools at elevated temperatures)



Bondmaster 620 is a "no mix," 100 per cent solid paste adhesive containing a thixotropic agent—will not drip or flow during cure. (Rubber & Asbestos Corp.)

ACG-2009 is Rubber & Asbestos Corp.'s brand new one part, glass-supported structural film adhesive that cures at temperatures as low as 150 F. It is solvent free and 100 per cent reactive.



TENSILE SHEAR STRENGTHS CHARACTERISTIC OF METAL-TO-METAL BONDS

0.064" 2024 T3 aluminum alloy bonded with **PLYMASTER ACG-2009** in accordance with specification: MIL-A-5090B)

CURE CYCLE*	TENSILE SHEAR, psi	
	R. T.	180°F
180 minutes at 150°F	3,000	3,300
150 minutes at 175°F	3,400	3,600
60 minutes at 200°F	3,500	3,600

*In applications where optimum strengths are not necessary and a lower temperature cure must be used, a cycle of 4 hours at 125 F is recommended. Strengths obtainable with this lower cure cycle range from 800 to 1,200 psi.

TABLE I—TOOLING WITH EPOXIES

DESIRABILITY FACTORS

	Laminate	Metal Core Surface Cast	Mass Cast	Paste
Dimensional stability	1	3	4	2
Shrinkage (during cure)	1	3	4	2
Least weight	1	4	3	2
Labor cost	4	3	1	2
Material cost (per lb.)	4	3	1	2
Strength	1	2	3	4
Toughness	1	2	4	3

NOTE: The above table is intended to be used only as a guide. Specific conditions in any particular application or plant may alter these factors.

WHICH METHOD? The table above will be helpful in determining which method to use. The ratings shown are established from the standpoint of desirability rated as follows: (1) most desirable (2) satisfactory (3) fair (4) least desirable.

—Ron Plastics

These are basic properties to be considered in the selection of any engineering material. In a sense, there is really no such thing as "an" epoxy resin due to the infinite number and variety of resins and physical properties that can be compounded by the formulator.

Tooling—Tooling with phenolics, polyesters and epoxies has been around since the late 1930's, but only within the past several years has it reached a high level of usage with the automakers.

Biggest spur has come from intensive effort of plastics industry and automotive specialists to nail down test methods, improve engineering standards and tighten evaluation of end uses in dictating material selection.

A simple catalogue of advantages of plastic tooling would include such features as the ease of tool design changes, duplication, revision and repair; reduced labor costs; faster tool delivery; inexpensive equipment; and resistance to moisture, temperature, lubricants and a great many solvents.

Enthusiasm for epoxies, which have galloped ahead of other plastics, is founded on the fact that they are more dimensionally stable, have superior adhesion to glass reinforcements, are easier to work with, are non-corrosive, and tougher and stronger.

Epoxy tooling is generally divided into four basic categories: laminating; surface casting; mass casting; and paste tooling. Each of these methods may be used

singly or in conjunction with one another.

Laminated tools, such as gage tools, checking and inspection fixtures, are excellent for dimensional stability and low in cost and build-up time. They are used where strength, accuracy and weight are prime considerations.

The laminated tool is made up of alternate layers of glass cloth and liquid resins. Three materials are normally required: epoxy surface coats, epoxy laminating mixes and glass cloth. After the final lamination, the resin solidifies into a rough, rigid form that will not corrode or warp. The finished piece has the exact size and shape of the surface from which it was molded.

Laminated skin panels and prototype parts can be made to the same gage as the finished steel part. This gives the manufacturing engineers a working sample from which they can plan stamping and production operations, determine material handling requirements, visualize die parting lines, etc., many weeks before final dies are completed.

For metal forming operations involving limited production runs, surface cast tools should receive serious consideration.

A surface cast tool usually incorporates a metallic core, rough cast to the general shape of the finished tool. The core is suspended over a model of the working face of the tool, and liquid epoxy is cast into the space between the model and the core.

TABLE II
EPOXY PLASTIC TOOLING

LAMINATING

form dies
paint spray masks
apply tools
router overlays
router forms
drill fixtures
master gage
plastic molds
accessory tools
chemical milling templates
inspection fixtures
duplicate master forms
assembly fixtures
Keller models
die model duplications
spotting racks
checking fixtures
welding fixtures
draw dies
foundry patterns
core boxes
polishing chucks
nesting fixtures
stripper pads
spotting slugs
body-in-white gages
prototype panels
hammer forms
plastic curing mold
plastic curing form
high temp/bonding fixture
heated matched molds
plaster break-a-way mold

SURFACE CAST

stretch blocks
vacuum holding fixture
nesting fixtures
checking fixtures
contour board
drop hammer punch
drop hammer die
draw dies
hammerforms
spotting slugs
foundry patterns
stripper pads
form dies
core boxes
core setters
core box-check fixture
pattern duplication

PASTE

contour boards
laminated tools
spine models
nesting fixtures
plastic tool repairs
lathe chucks
spinning chuck
foundry patterns
spotting slugs
loose piece in molds
mannequin molds
wood pattern repairs
corner fillets
general adhesive
grouting material
filling casting imperfections
potting drill bushings

MASS CAST

stretch blocks
router forms
form blocks
hammer forms
form dies
draw dies
bulging dies
foundry patterns
core boxes
drop hammer die
drop hammer punch
vacuum chucks
plastic curing mold

TABLE III
THERMAL DEGRADATION AT 260C

Resin/Hardener	phr	Heat Distortion Temperature ⁽¹⁾					
		original	4 hr.	8 hr.	24 hr.	72 hr.	120 hr.
D.E.N. 438/MNA ⁽²⁾	101	160	242	274	298	266	257
D.E.R. 331/MNA ⁽²⁾	93	137	177	198	228	213	213
D.E.N. 438/BF,MEA	5	239	133	128	151	177	0
D.E.R. 331/BF,MEA	5	160	52	0	0	0	0
D.E.N. 438/MDA	28	206	182	142	116	0	0
D.E.R. 331/MDA	27	155	124	100	0	0	0

⁽¹⁾ ASTM D-648-56 (264 psi) results in °C after 260° C aging for hours indicated.

⁽²⁾ Also included 1.5 phr of DMP-30 accelerator.

All specimens gelled at 93° C and post-cured 18 hours at 170° C prior to original HDT determination.

—Dow Chemical

Epoxy novolac resin, D.E.N. 438, exhibits improved HDT (heat distortion temperature) performance over standard epichlorohydrin and Bisphenol-A system (D.E.R. 331).

TABLE IV
PHYSICAL PROPERTIES BLENDED D.E.R. 331/X-2673.2

D.E.R. 331/X-2673.2	100/0	90/10	70/30	50/50	30/70
Hardener: X-2654.4, phr.	22.4	21.3	19.2	17.1	15.0
Flex. Strength, psi., avg.	15,200	15,200	13,200 ^a	—	—
Modulus x 10 ⁵	4.0	4.4	3.7	—	—
Compressive, psi., avg.	22,400	25,200	25,300	27,100	1,700
Modulus x 10 ⁵	3.9	3.5	2.8	0.085	0.016
Tensile, psi., avg.	5,800	7,600	6,800	847	—
Modulus x 10 ⁵	2.0	2.2	1.4	0.015	—
Impact, ft.-lbs.	0.38	0.69	0.89	2.7	3.9

Dow Chemical's experimental resin X-2673.2 improves flexibility of conventional systems. Epoxy additive is distinct from modification by inert plasticizer and/or by special hardener

TABLE V
PROPERTIES (ASTM TESTS)

	31-A	31-B	31-C
Density	1.24	1.62	2.28
Shore D Hardness: R. T.	89/88	90/90	91/90
200° F.	86	88	91
300° F.	86	88	88
400° F.	75	80	82
Ultimate Comp. Strength	—	30,000 psi	25,000 psi
Flexural Strength			
8 ply-1500 glass laminate		Casting	Casting
R. T. 35,000 psi		10,000 psi	8,600 psi
300° F. 28,000 psi		—	—
400° F. 16,000 psi		—	—

Epoicast 31 high temperature resins are for service up to 400 F. Type 31-A for laminating, 31-B for casting, and 31-C for gel coating. (Furane Plastics)

Castings are most often made against cores of kirkstone, aluminum or steel.

Used extensively throughout the automotive industries for prototype die work, a current list of surface cast forming tools would

include forming, stretch, draw, some drop hammer, hydro-forming and some blanking dies.

Although most production men think of plastic dies in terms of short runs the Long Manufacturing Division, Borg-Warner Corp.,

stamped out over 130,000 auto radiator tank tops of 0.025 in. brass with an Epoxy-Alloy ES (epoxy mass casting reinforced with steel fiber and surfaced with an epoxy steel-fiber-flocked coat—Bakelite Div., Union Carbide) punch and die. More costly contoured areas were epoxy, while critical wear surfaces were metal.

Checker Motors Corp. has drawn as many as 18,000 steel parts with a single Ren epoxy faced die. Used for drawing wheelhouses, hood hinge reinforcements and floor pans, Checker reported that it was 40 per cent easier to draw with an epoxy die because of the distribution factor. Less spot strain occurred due to the insulating factors and the ability to use slip fillers in the plastic. The floor pan die was epoxy faced, and the wheelhouse die was backed up with boiler plate.

When properly used (within the strength factors of epoxy), plastic forming dies can eliminate or reduce, significantly, the cost of patterns, milling, grinding and spotting.

Mass cast tools (solid epoxy mass) are sometimes used where large surfaces are involved such as stretch blocks or hammer forms. Major drawbacks to this method are low strength properties and high shrinkage. Approaches to lick these problems include fillers such as glass to boost strength, and first-stage laminations to reduce shrinkage. Ren reports that significant gains have been made with its RP-4003 (chopped glass and steel fibers cured under heat and pressure).

Paste epoxies are splining materials used to join templates in making dimensionally accurate models. Generally caulked or trowled, pastes are non-flowing, and ideally suited for inclined or vertical surfaces.

Adhesives—Epoxies are ideally suited for bonding a host of dissimilar materials such as glass, ceramics, metals, paper, foil and most plastics. Many of the problems previously experienced in bonding some of the crystalline and less polar plastics have been overcome. Polyethylenes and fluoro-

carbons are currently being adhesive-bonded after surface treatment. Plasticized vinyls can be bonded using various epoxy-Thiokols.

Epoxy adhesives are available as liquids, pastes, mastics, powders, syrups, and films, with viscosities ranging from that of water to that of heavy cold cream. They can be sprayed, brushed, dipped, rolled, dusted, extruded, trowelled and spread. They can be compounded, filled and alloyed, often with polamide, polysulfide rubber or phenol-formaldehyde resin.

Their special advantages are:

- high specific adhesion to most all materials due to their polar groups (epoxide, hydroxyl, amine, etc.)
- cohesive strength is so great that stress failure often occurs in the materials being bonded
- shrinkage is fractional in comparison with other adhesives
- better thermal stability than the thermoplastics
- highly insensitive to moisture and solvents
- effective barrier to heat and electricity
- cures without releasing water, volatiles and other by-products
- properties can be altered to fit the job

Although structural adhesives have been big sellers in the aircraft's industry for years (B-58 bomber has 1000 lb of structural adhesives), the "battle of the glue line" in the automotive industry has been a slow, foot-slogging campaign.

Automakers, among the first to see the economies of gluing, have confined adhesives almost wholly to such non-structural uses as bonding brake shoes, clutch facings, filters, weatherstripping, insulation, interior and exterior trim, and radios. Also for sealing mirrors, batteries and for repairing bodies and fuel tanks.

Really big gains remain just around the corner.

Manufacturing specialists at General Motors' Technical Center have pointed out that adhesive bonding provides definite advantages over more conventional methods of fastening. These include:

ADHESIVE PROPERTIES

Armstrong Products Co.'s A-6 adhesive was formulated primarily for bonding aluminum. Table at the right shows some typical physical properties obtained on bond made between 1 in. wide aluminum specimens — length of overlap was 0.5 in.

- superior joint appearance
- elimination of weld dimples
- no warping
- no burn through on light gage metals
- load can be distributed over large area
- bond is impervious to salts, fuels, lubricants and corrosive atmospheres
- adhesive provides thermal, electrical and sound insulating qualities
- reduced cost of capital equipment
- versatility of bonding a great number and variety of materials
- elimination of galvanic action
- possibility of bonding areas that otherwise could not be joined

With all this on the plus side, then what is slowing the advance?

One of the big reasons has been the lack of adhesive education. Many potential users have little confidence in these materials, . . . no knowledge of their advantages or reliability. Although adhesives have been piled upon adhesives, the buildup has been indiscriminate, full of "crapehangers," and too often has evaded the cost issue. Bucking methods of joining materials that represent over 30 years of engineering cannot be done successfully on the basis of performance alone, . . . at equal or less cost, yes.

Automotive engineers also agree

TABLE VI

TEST	TEST TEMP. ° F.	CURED AT 200° F. FOR 45 MIN.
Tensile Shear.....	77	3070 psi
Tensile Shear.....	190	2400 psi
Tensile Shear.....	-70	2940 psi
Impact Strength.....	77	Over 15 ft.-lb.
Impact Strength.....	-70	Over 15 ft.-lb.
Bend Test.....	—	208 lbs.
Tensile Shear after:		
3 hours boiling water.....	77	3200 psi
3 hours 200° F. oil (SAE-10).....	77	3450 psi
7 days—Ethylene Glycol.....	77	3300 psi
7 days—Anti-Icing Fluid, AN-F-13.....	77	3400 psi
7 days—Hydraulic Fluid, AN-O-396.....	77	3500 psi
7 days—Hydrocarbon, AN-F-42.....	77	3400 psi
30 days—Tap Water.....	77	3000 psi
30 days—Salt Spray Exposure, Spec. QQ-M-151.....	77	3300 psi

that structural adhesives are not yet suitable as production tools. Although newly developed high solid pastes have cut some of the corners, much more hunting and homework is needed to shorten fabrication and cure cycles, simplify preparation, improve flexibility, and resistance to shock and thermal stability.

Also unpublicized is the fact that repair shops are not educated or equipped to profitably handle new methods of joining and fastening, assembling and disassembling.

Adhesives will have to be proved, application by application, with one hand on the standard's manual and the other on the till.

Coatings—Epoxy resin finishes also have established a beachhead on the assembly line as primer costs. Only meager information is available since specific formulations are closely guarded and vary considerably between users.

There are roughly six basic paint formulations in the epoxy group that differ primarily in the modifiers used in the final cure. They are epoxy-phenolics, epoxy-ureas, epoxy-polyamides, epoxy-amines, epoxy esters and melamine-modified epoxy esters.

Of greatest commercial significance as an automotive coating are the epoxy resin esters. These are simply esterification products of epoxy resin with fatty or rosin

(Turn to page 100, please)

Numerically Controlled Machine Tools

in Farm Equipment and Construction Equipment Plants

NUMERICALLY controlled machines, of various degrees of complexity, are beginning to find a place in farm equipment and construction equipment manufacturing. Starting as recently as a year ago, a few of the electronically controlled machine tools have appeared in both production lines and experimental departments. As they prove themselves in use, the number is steadily increasing.

The first of these machines to be installed, as far as information can be obtained from the manufacturers, was a Kaukana horizontal boring machine, put into service at International Harvester's Construction Equipment Div. plant at Melrose Park, Ill. The machine was bought a little more than a

By Kenneth Rose

MID-WEST EDITOR

year ago to bore, drill, ream, mill, etc. large, low volume production parts used in building heavy duty construction machinery. It has also proved invaluable in the machining of a small number of various sized engine blocks of new design, thus eliminating the need to build fixtures prior to the design being finalized. The machine has point-to-point tape controls on table motions, and controls on spindle feed and travel. It can also be operated manually, and is so used much of the time. It was the opinion of Harvester's production engineers, however, that the controls

would pay for themselves with the savings on low production and experimental production. All the boring, drilling, and tapping on the cylinder blocks was done on this machine, with excellent producibility and with accuracy to plus or minus 0.001 in.

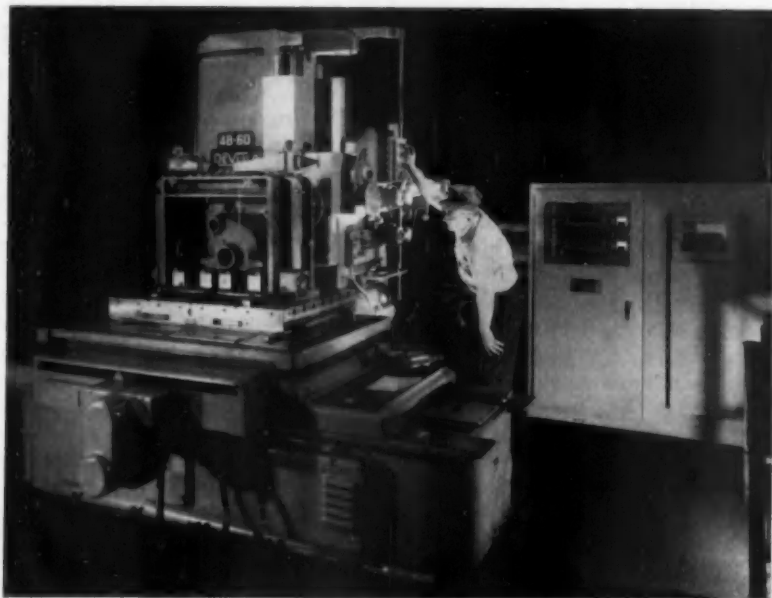
The cylinder bores, crankshaft bearing bores, oil lines (these were rifle bored), dowel holes for cam gear covers, dowel holes for cylinder head, and so on, were bored, and reamed, drilled, or tapped where required, from programs drawn up for the block machining.

Six positions of the block casting on the machine table were required to reach all of the bores. For the crankshaft bearing bores, for instance, one end was first bored on the machine, and the casting was then rotated 180 degrees on the table, a bushing was inserted in this bore to carry the weight of the bar, the other end bore was machined, and the five inside bearing surfaces were then bored with a bar supported in the two end bushings.

In the opinion of Harvester's production men, the machine is excellent for short runs and experimental models, but would not be able to compete with special purpose equipment on high production items.

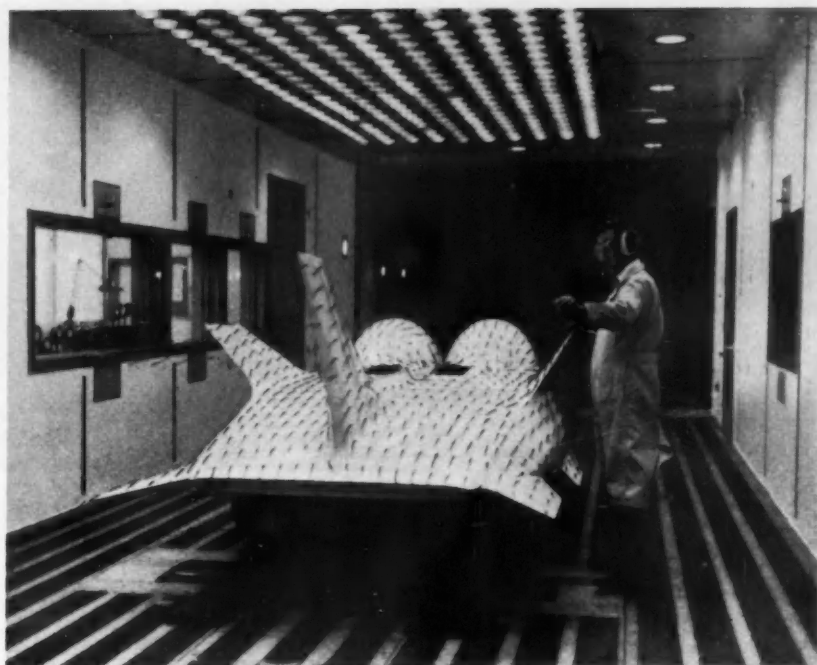
Deere and Co. installed a tape controlled Sundstrand vertical milling machine at its Waterloo Tractor Works when production lines were set up to produce several new engines. Four different styles of crankshafts were needed, and each had locating areas to be milled off in preparation for subsequent machining. These areas vary dimensionally and in number. Therefore they require a sequence of operations controlled by different tapes for each style. The tape controls positioning of the table and column, also it actuates the indexing fixture, preset vertical head, table feed and rapid travel.

The crankshaft is mounted between centers in an indexing fixture.
(Turn to page 104, please)



DeVlieg Spiramatic Jigmil horizontal boring and milling machine, with eight-channel tape control, installed at Allis-Chalmers Mfg. Co.

A typical
wind tunnel test
of a new GM design



Architects of the Automotive Future

PART II

PART I of this exclusive report was published in the June 15 issue of **AUTOMOTIVE INDUSTRIES**, page 59. It and this concluding part comprise the first tape-recorded conference of leading automotive designers in the IDI (Industrial Designers Institute).

Subject of the conference was, "Meeting the Challenge of Modern Mobility in Automotive Transportation."

The discussion continues herewith, from page 66 of the June 15th issue . . . with a re-introduction of the speakers . . .

PARTICIPANTS in the Industrial Designers Institute panel included:

Charles Jordan—chief designer, Cadillac Studio, GM Styling;

Richard Teague—asst. director Automotive Styling, American Motors;

Kenneth A. Hopkins—Detroit Chapter chairman, Industrial Designers Institute;

John Najjar—executive stylist, Advanced Styling, Ford Motor Co.;

Arthur Tarabusi—designer for Automotive and Industrial Divisions, Great Lakes Region, Reynolds Metals Co.

With the "Outlook for Vehicle Evolution" as the theme for Part II, the following points were made:

Mr. Najjar: Of the many differ-

ent types of vehicles that have potential for the near and distant future development, two types stand out in my estimation. One, the land cruiser type, second, the commuter type.

For many years, the six-passenger general purpose sedan was the mainstay of the automotive industry. Now, however, the growing popularity of the station wagon, coupled with increased travel and growth of the individual family, and of the suburbs, has indicated a need for more flexible vehicles.

The land cruiser, providing the appeal and utility of the station wagon, with that of a small house trailer, appears to be a logical area for future exploration. Conceivably in a vehicle slightly larger than the current Ford station wagon, the automotive industry can effec-



Three leading automotive designers shown discussing "The Challenge of Modern Mobility," in a special conference of the Industrial Designers Institute are left to right: John Najjar of Ford Motor Co.; Charles Jordan of Cadillac Division of General Motors, and Richard Teague of American Motors

tively design and package for the needs of a family that wanted to use its family car for camping, hunting or long vacation trips without having to haul a trailer.

Secondly, the commuter who now uses his six-passenger family car to go to and from work while he occupies only one seat certainly might be interested in a smaller one or two passenger car, economical, highly maneuverable and perhaps with something of a sports car flavor.

Mr. Tarabusi: Although many concepts created by the automotive designer are not necessarily of a daily practical use, certainly many designs ultimately find their way into new aspects of vehicle utility.

Many changes in the basic utility are the result of market research. However, stylists can visualize a need which can later be predicted by public opinion through market analysis.

Reliability as a Factor

Mr. Hopkins: Please cite one example of how an automotive designer achieves greater reliability in vehicular design.

Mr. Jordan: The enclosure of components which occurred over a period of years has made it a better looking car. At the same time, components are protected from damage to exposure or corrosion.

Another way automobile designers have improved functional reliability today is by using new and better materials in automobile interiors. Interiors today are more

resistant to stains, wear longer, fade has been reduced and the materials used are much easier to clean and maintain. In addition, interiors are better-looking throughout the life of the automobile.

Mr. Najjar: We feel that Ford styling through the never-ending constant teamwork of mutual effort with engineers, the designer does achieve reliability and vehicular designs.

Each item designed on a vehicle does receive attention, not only as to its appearance, but also its abil-

ity to operate as planned. As an example, a door handle, steering wheel or control knob designed too delicately would not withstand the basic requirements of reliability, let alone fabrication and assembly standards.

Mr. Tarabusi: Reliability means continuous function with minimum of care and maintenance. A prime example is aluminum exterior trim.

Mr. Teague: Reliability to the car owner becomes an extremely important factor in automobile styling. The production stylist is constantly confronted with problems that could, unless carefully thought out, become major headaches to the new car buyer.

Interior automotive style designers are continually confronted with problems that could, unless checked,

Five Tasks of Designers

Mr. Jordan: At General Motors we believe basically there are five specialized tasks that designers must perform in developing new vehicle ideas.

First, the designer must anticipate new design opportunities. He must know people—their living habits and their needs.

Secondly, the designer must understand production economics. The designer must be concerned with cost, but cost should not always be the limiting factor because good design can upgrade a market.

Thirdly, the designer must respect human requirements and the demanding standards of safety, comfort, convenience and ease of operation.

Fourthly, the designer is the architect of the car. He must know anatomy of this thing he is designing. He must satisfy strict human and mechanical requirements.

Fifth, the designer must utilize esthetics to turn lifeless dimensions into a beautiful, exciting and dynamic vehicle. His artistic sense comes into focus here.



affect the reliability and owner loyalty of a new car purchaser. Seat and carpet fabrics must be composed to have excellent wear and fade characteristics and that are not too nubby or subject to staining.

Safety as a Factor

Mr. Hopkins: Please cite one example of the automotive designer's aid to the safety of the vehicle used.

Mr. Najjar: Most automotive companies have long since abandoned hood projectiles and open-end exterior door handles. Car interiors now incorporate such safety features as deep dish steering wheel, seat belts, padded visors and instrument panels.

The increased use of glass and the reduction in the size of roof pillars often have been dismissed as expensive whims of the stylist and as unnecessary headaches for body engineers and glass manufacturers. The fact is that the increased visibility available to the driver, which in turn affords him a greater measure of control, is probably one of the greatest safety improvements conceived.

Mr. Tarabusi: By knowledge of the properties of the materials used, the designer must make best use of these to augment the safety of a vehicle. An aluminum wheel properly designed has advantages over conventional designs, in my opinion.

Mr. Teague: The exterior as well as the interior automotive stylists

▲
Full size rendering of a composite car produced by the styling and design sections of the five major automobile producers for the latest National Automobile Show in Detroit

are constantly aware of the growing enormous traffic toll throughout our nation.

Whenever a new instrument panel, steering wheel or control knob is designed, the stylist's first thought in mind is that these items must not only be easy to operate and good looking, but also that they must not become a lethal protrusion in the event of an accident.

We have an excellent safety feature on the rear tailgate on our Rambler 3-seat wagons that come equipped with a side swing safety gate. As the name implies, the door swings out, pivoting from the driver's side. This funnels the passengers toward the curb side on either entering or leaving the vehicle. In addition, a unique safety-lock system is built into this fifth door. This feature is aimed primarily for the safety of children.

Mr. Jordan: How many times have you followed an automobile, traveling at speed, with its turn signals operating? The driver is not aware that the signal for his last turn has failed to cancel. The signal is giving the drivers behind him completely false information, reducing the effectiveness of the indicator and creating a serious traffic safety problem.

Cadillac designers, recognizing

this problem, set to work to design a more effective directional signal. We reasoned that if the indicator were more directly in the driver's field of vision where it was not necessary for the driver's eyes to leave the road or necessary for him to change his focus to any great degree, the indicator would become much more effective. And it would contribute to the safety of drivers and those in his immediate area.

A directional signal indicator was designed on the top surface of each front fender as far forward as possible. This indicator has been in service nearly two years now. In addition to being a new design feature, it has proved its effectiveness as a desirable safety feature.

Economy as a Factor

Mr. Hopkins: Please give one example of the automotive designer's aids in the development of economy for vehicle users.

Mr. Tarabusi: I think the biggest example of how an automotive designer has actually aided in the development of economy has been presenting to the consumer positive evidence of the futility of useless weight.

Specific areas of design eliminating weight increase with each new application of light-weight material in the automotive industry. The conservative approach towards body styling certainly results in lower maintenance costs in terms of caring for the car on a day to day basis and repairing the car



Cadillac Division of General Motors uses a unique "anthropometer" to obtain measurements of typical drivers before planning design features of new models

when collision or other damage results from misuse.

Mr. Teague: Economy of operation is looked upon at American Motors as far more than just fuel economy. The stylist recommended choice of materials in many cases has a direct bearing on ultimate user economy of his new car.

As an example, American Motors switched to aluminum extrusions in the grille in both the Classic and Ambassador models for 1961. Previously die-cast grilles were used which were subject to breakage, rust and corrosion problems and from an economy standpoint, weight. A weight saving of over 60% was effected in the Ambassador grille over the 1960 model.

Mr. Jordan: Here is a little different angle on this business of economy. At General Motors styling we conduct aerodynamic wind tunnel tests with scale models to study new overall design proposals in the early stages of a design program before completing work on the full size models.

We know that the air flow characteristics of a body surface have a definite relationship to power requirements, vehicle handling and directional stability. The most important factor to consider is drag, which directly affects fuel economy. We have learned that sometimes very minor alterations in surface design can improve overall fuel economy and operating characteristics without drastically changing the appearance that the automobile designer wants to achieve.

Mr. Najjar: An economy car achieves its economy largely as a result of being small in size and

low in horsepower. In its basic configurations, the stylist has to allow for the fact that large piece costs or tool costs are not available. He must rule out multiple piece fenders, for instance.

Let's visualize a Falcon front fender versus a Continental front fender. In the Falcon, there is an economy of sheet metal in size as well as in the simplicity of surface configuration. On the Continental, where economy is not the prime objective, a multiple piece fender can be employed.

Surface configurations must be styled in a way that will enable manufacturing people to achieve basic operating economy. As a result of all this, the customer is assured of both economy of cost, and economy of upkeep.

Comfort and Pleasure as Factors

Mr. Hopkins: Please cite one example of how the automotive de-

signer aids the comfort and pleasure of vehicle driving.

Mr. Teague: Without question the most important factor that must be considered in the styling of an automotive vehicle is passenger comfort. This, of course, not only applies to seating, but in entrance and egress as well.

It is of little comfort to the car owner if he is at ease once in the car but has knocked off his hat and thrown out his sacroiliac in arriving at this position. Entrance room must be kept to an acceptable standard and this is one of the prime ground rules that we at American Motors are most concerned with in laying out of any new or heavily altered design.

Mr. Jordan: At General Motors, the automobile designer recognizes that human comfort is one of the single most important considerations in automobile design. The human factor studies at GM styling indicate that two areas of human comfort are important.

The first area is freedom from mechanical distraction and is met by a sensible approach to body design by the automobile designer and by sound research and design by the body and chassis engineer.

The second important area of comfort is the environment within the passenger compartment. Seat comfort, or that quality of support which gives the impression of being hard, soft, pillowy or firm is one important consideration. Attitude comfort, or the relative posi-

(Turn to page 96, please)



Checking measurements of seating adjustments in a typical mock-up of a new Cadillac design

Production Techniques for Aluminum Cylinder Blocks at Central Foundry Division of GM

A RECENT tour of the Defiance (Ohio) plant of the Central Foundry Division of General Motors Corp. revealed that this is one of the most modern foundries in the industry, boasting the latest types of mechanized equipment, and exhibiting outstanding house-keeping and worker comfort environment.

This foundry is exceptionally versatile. It produces all of the Oldsmobile Rocket V-8 engine grey iron blocks and cylinder heads; blocks and heads for Detroit Diesel; cylinder heads, bearing caps, and camshafts for GMC Truck engines; malleable iron differential carriers, wheel hubs, and front door strap hinges.

More recently Defiance placed in production the aluminum cylinder block and heads for the aluminum V-8 engines installed in the Buick

By Joseph Geschelin
DETROIT EDITOR

Special, Olds F-85, and Pontiac Tempest. A good description of the semi-permanent-mold technique employed in making aluminum blocks and heads, complete with pertinent illustrations appeared in AI, December 1, 1960.

Since the inception of the aluminum engine program at Defiance—starting July 1960—the plant consumed some 12-million pounds of No. 356 aluminum-silicon-magnesium alloy in the first seven-month period. At the present writing the installed molding equipment has a capacity of 1300 blocks and 2600 heads per day. Whereas the cylinder blocks are cast in a vertical po-

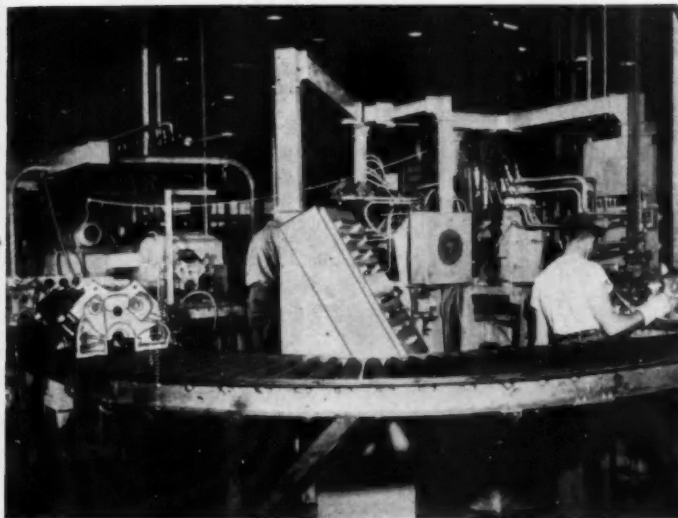
sition, as described in the earlier article, the heads are cast in normal position with metal poured directly into the risers, i.e., without employing a sprue.

Since the major interest is in the aluminum foundry operation, the object here is to supply some additional details that were not available at the time the earlier article was published. Let us note too at this point that the term "semi-permanent-mold" can be stripped of any mystic quality by saying that it combines both the features of the metal permanent mold, and expandable special sand cores.

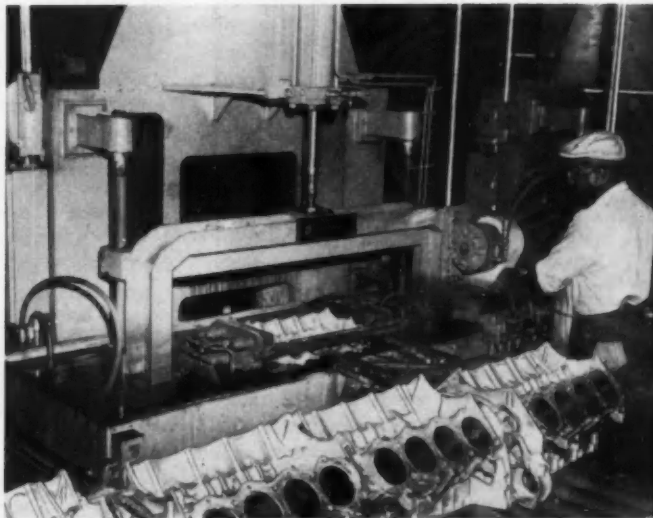
Let us consider first the matter of the urea sand cores for the aluminum castings. Six are required for the cylinder block—four for the crankcase area, two for water jacketing. Sand cores also

(Turn to page 106, please)

Aluminum block castings are machined in the equipment shown in the left background. Moving to the right, they are processed through a special machine which automatically checks dimensions from 22 target points.



Blocks are submerged in water and pressure tested with compressed air.





Axle flanges are faced with single point tools in Harvester's production plan



Two banks of single point tools turn down snap rolls

Special Tooling at IHC Plant Solves Production Problems

A CONSTANTLY recurring manufacturing problem in the farm equipment industry is that of planning for adequate tooling and production capacity while holding tooling costs to a reasonable level. Some production volume is not high enough to warrant the elaborate tooling of the automobile industry.

International Harvester's East Moline Works recently set up production equipment for several parts in which single point cutting tools were used to simplify tooling and hold tooling costs to a minimum. In order to increase production, the single point tools were used in multiple mountings, thus reducing the time for a single cut. As the tooling is set up, no cut is longer than about 3 in.

When planning was begun for production of axles for the three models of combines made here, both the quality control standards and cost of equipment entered into methods and machine selection. The

By Kenneth Rose
MID-WEST EDITOR

axle is a box section weldment in mild steel, with flanges at each end for attaching the final drive housings, and with brackets for attaching the transmission case and the hydraulic cylinders for raising and lowering the machine platform. It is about 9 ft in length, of $\frac{1}{4}$ in. steel, and about 6 in. by 4 in. over the outside of the axle. The steel flanges at the ends are elliptical, $11\frac{1}{2}$ in. by $9\frac{1}{2}$ in., and about $\frac{5}{8}$ in. thick before machining. Requirements were estimated at about 50 pieces per day.

It is necessary that the faces of the flanges to which the final drive housings are to be attached be held parallel, and that the distance of each face from a locating hole in the transmission attaching bracket be held very accurately. To obtain

parallel faces, it is desirable that the two flanges be faced simultaneously in one setup. Facing the flanges one at a time would involve excessive handling of the pieces, and difficulty in keeping the two surfaces, 9 ft apart, exactly parallel. The production rate contemplated, however, would not warrant the purchase of a double-end milling machine capable of spanning the 9-ft shaft length.

The method finally fixed upon makes use of a machine specially built by Moline Tool Co., consisting of two boring heads mounted about 9 ft apart on a common base. On each spindle is mounted a standard generating head by Modco, of Detroit. Two single-point Thro-A-Way type cutting tools are mounted in each generating head.

A fixture on the machine bed positions the axle. In order to obtain maximum versatility, the fixture is made adjustable, by the use of keys, to each of the three models of axles used. The fixture holds the axle so that each flange is faced off to the required distance from the locating hole in the transmission bracket.

The single point tools in the tool
(Turn to page 110, please)

..... Trends in the CONSTRUCTION EQUIPMENT INDUSTRY

New Hough Rubber-Tired Model D-500 Articulated Pusher-Dozer

THE Frank G. Hough Co., Libertyville, Ill., has announced an addition to its new Paydozer line of rubber-tired pusher-dozers. This Model D-500 weighs in excess of 100,000 lb.

One of the most unusual features of this new Paydozer is the full-hydraulic, articulated steering which provides exceptional maneuverability. The turning radius of this unit, 25 ft., is less than its overall length.

The D-500 Paydozer is powered by a 700-hp turbo-charged, V-12 Cummins Diesel engine, reduced to 600 hp at 2100 rpm for longer life and lower maintenance.

The power train includes a Hough-built, full power-shift transmission that requires no stopping for range shifts. This transmission is a full-reversing, constant-mesh type with speed ranges up to 15 mph in both forward and reverse.

Power-transfer differentials on both axles provide excellent traction. When one wheel is capable of more tractive effort than the other on the same axle, it can automatically receive 38 per cent more torque. Heavy-duty planetary final drive gearing in wheel hubs keeps torque-transmitting requirements low in the axle shafts and drive train. The drive train and three-stage torque-converter deliver approximately 80 per cent of peak drawbar over 75 per cent of the entire range.

The hydraulic system is closed and pressure-controlled for maximum protection.

This new Paydozer offers, as optional equipment, an automatic central lubrication system which services all bearing surfaces with the exception of engine fan and drive shaft universals. Some 27 different points are automatically greased at 30 minute intervals during machine operation.

A low center of gravity is obtained through approved use of dry ballast material in all four tires. This material is 100 per cent heavier by volume than liquid, and the weight of the ballast is independently supported on the ground

By
**Kenneth
Rose**

instead of imposing additional loads on the axles. It has the further advantage of reducing bouncing action.

LW Announces 100-HP Grader

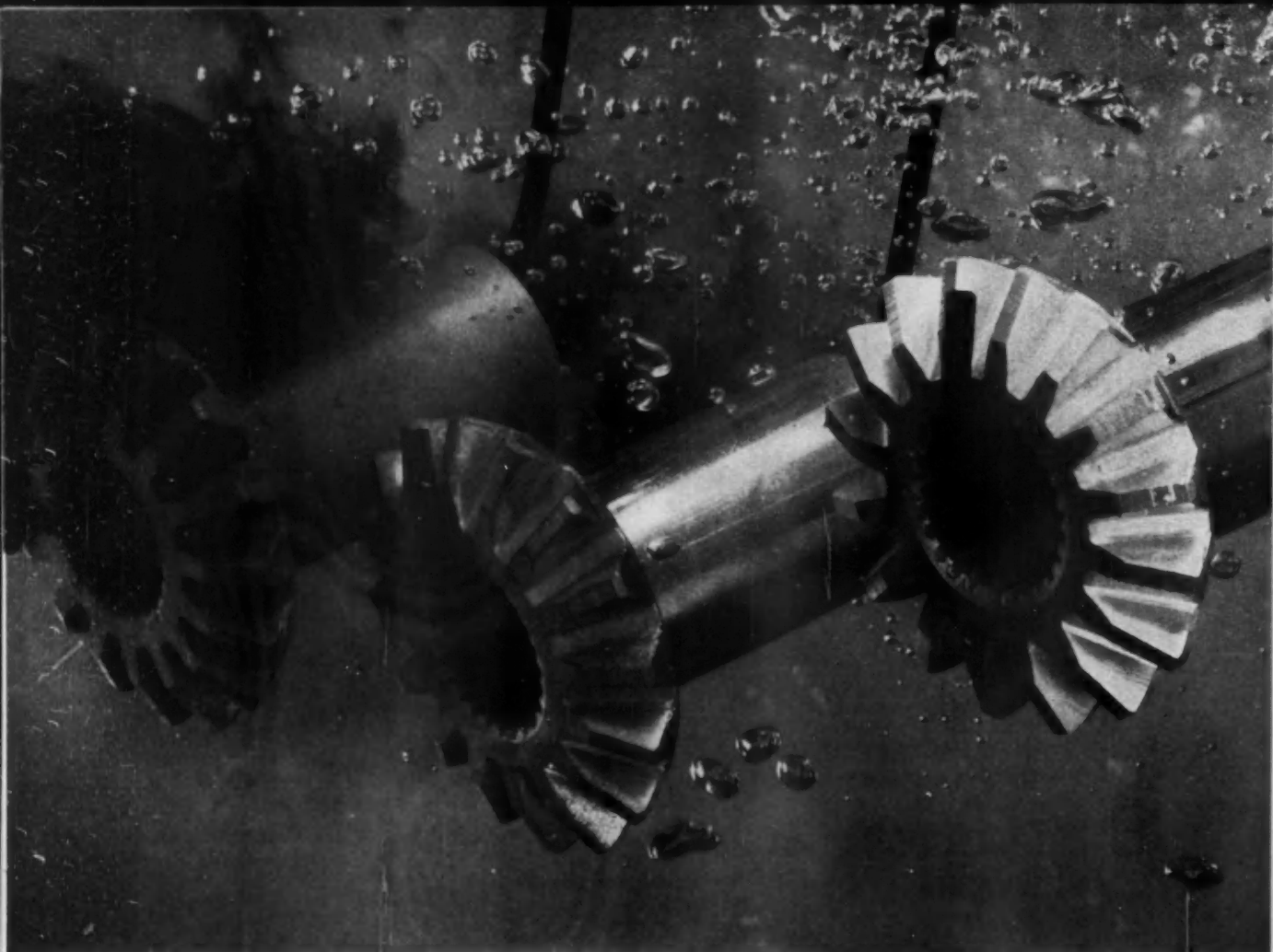
A new version of the popular and low-priced Model 330 LW motor grader has been announced by the LeTourneau-Westinghouse Company. It offers 100-hp, compared to the 85-hp 330, and has been designated as the "330-H." The companion-model 330 remains in the line.

Although definitely in the "economy" category of today's motor graders, the 330-H offers LW's traditional "big" grader features, including 8 forward speeds (to 23.6 mph), optional creeper speeds as low as 1/4-mph, 4 reverse speeds, constant-mesh transmission, rubber mounted engine, and easy-to-operate mechanical controls. Equipped with 13.00-24 tires front and rear, and with power steer, the 330-H weighs 21,690 lbs with a GM 3-71 engine and 22,090 lbs with its optional Cummins J-6-B1 engine.

The 330-H was added to the array of LW graders, according to company officials, primarily to accommodate many counties and municipalities that wanted LW grader quality in the 100-hp category so often specified. ■



The new D-500 Paydozer pusher-dozer



NEW SAFETY SOLVENT permits on-the-line cold degreasing . . . 100% parts inspection

FAR GREATER SAFETY than most other chlorinated solvents makes Chlorothene® NU specially inhibited 1,1,1-trichloroethane ideal for the cold removal of greases, waxes, tars, and oils. In cleaning for spot inspection of close tolerances, or for 100% inspection as on broaching machine operations, Chlorothene NU may be used quickly and safely by spray, dip, bucket or wiping methods. Die parts may be cleaned in the shop without having to send them out for vapor degreasing.

By providing answers to both of the chief hazards of common cold-degreasing solvents, Chlorothene NU is leading a breakthrough in solvent cleaning. Having *no* fire or flash point measurable by standard methods, it is removed from the flammable class of cleaning compounds. Maximum allowable vapor concentration of Chlorothene NU sol-

vent is a high 500 ppm, compared to carbon tetrachloride at 25. Chlorothene NU is easily recovered by distillation. It can be used safely on most electric motors, instruments, bearings, and on all common metals including aluminum, zinc, corrosion-prone "white-metal" alloys, and on many plastics.

HYDRAULIC FLUIDS continue to be important objects of research at the Dow Automotive Chemicals Laboratory. They are custom engineered, and Dow's broad background in polyols, glycols, and glycol ethers assures hydraulic fluids of the highest quality, and with an almost limitless range of properties.

VORACEL® foamed-in-place rigid urethane offers new advantages for sound deadening, insulating, "pocket" sealing, and strengthening between structural members. The new process

gives a superior, and economically feasible covering and filling material for many automotive uses. For additional information, contact your nearest Dow sales office.

DOW AUTOMOTIVE CHEMICALS LABORATORY

Created expressly to serve the needs of the automotive industry, Dow's Automotive Chemicals Laboratory is active in technical service and development. This laboratory is continually researching and developing coolants, hydraulic fluids, cutting and grinding fluids, function fluids, fuel and lubricant additives, and synthetic lubricants. To see how this laboratory can be of assistance to you, contact your nearest Dow sales office or write Chemicals Merchandising in Midland.

THE DOW CHEMICAL COMPANY

DOW

Midland, Michigan

News of the MACHINERY INDUSTRIES

By Charles A. Weinert

Net New Orders for Machine Tools Totaled \$50.3 Million in May, Holding Line at About Recent Volumes. Industry Takes New Tack on President's Tax Credit Incentive Plan

M-T Sales During May Continue at Same Rate

May's volume of machine-tool net new orders, at \$50.3 million, was on the low side, but almost at the same rate as during the past year or more. The volume in May did exceed that in April, to the extent of about \$2.65 million.

The above applies to metal-cutting and metal-forming machines combined. The metal-cutting sector, in May, showed up to better advantage than the metal-forming sector.

Net new orders for cutting machines amounted to \$42.5 million in May. For April the figure was \$41.3 million. The five-months' 1961 monthly average is \$42.8 million. In 1960, May bookings were \$37.95 million; and the monthly average for the year was \$41.9 million.

Total net new orders for cutting machines, booked in the first five months of 1961, now amount to \$213.9 million—compared to \$214.25 million for the same period of 1960.

During 1961, foreign orders for cutting machines have continued to come in at a relatively high rate. For the five months, net foreign orders totaled \$61.5 million, while net domestic orders totaled \$152.4 million.

Forming-machine net orders in May are valued at \$7.8 million. In April they amounted to \$6.35 million; but the five-month 1961 average is \$11.3 million. In 1960, May forming-machine net orders came to \$12 million; and the year's monthly average was \$12.5 million.

For the five months '61, forming-machine net orders now total

\$56.6 million, versus \$66.55 million for the same period of 1960. In the 1961 total of \$56.6 million, \$12.45 million are net foreign orders and \$44.15 million are net domestic orders.

Shipments in May of both types of machines, at \$57.8 million, were at the highest rate of the year, and also better than 1960's monthly average of \$54.3 million. But the total for the first five months is less—\$257.5 million versus \$274.3 million in 1960.

In May, cutting-machine shipments totaled \$42.85 million and forming-machine shipments \$14.95 million. The 1960 monthly averages were respectively \$42.3 million and \$12 million.

For the first five months of 1961, cutting-machine shipments totaled \$197.6 million. In 1960, the figure was \$216.05 million.

On forming machines, the 1961 five months' total is \$59.9 million; while in 1960 it was \$58.25 million.

These statistics—still preliminary for the month of May and,

to that degree, also preliminary for 1961—were based on data supplied by the National Machine Tool Builders' Association.

Industry Compromises on Investment Credit

President Kennedy's tax credit plan for investments in new machinery and production facilities, offered as a modernization incentive, may either be by-passed by Congress this year, or end up with some compromise—according to latest reports.

Industry now is trying for a compromise after finding that its opposition to the plan and push for overall depreciation reform were apparently leading to no action at all.

Among industry groups taking a new approach are the Machinery & Allied Products Institute and the National Machine Tool Builders' Association.

MAPI has summarized industry's new position by stating:

(Turn to page 130, please)

METAL CUTTING AND FORMING MACHINE TOOLS

Net New Order Receipts, and Shipments

(Millions of Dollars)

	Net New Orders			Shipments		
	Cutting	Forming	Totals	Cutting	Forming	Totals
1961						
Jan.	\$35.75	\$20.35	\$56.10	\$36.95	\$ 8.55	\$45.50
Feb.	39.45	6.95	46.40	35.60	10.05	45.65
March	54.90	15.15	70.05	42.05	12.80	54.85
April	41.30	6.35	47.65	40.15	13.55	53.70
May	42.50*	7.80*	50.30*	42.85*	14.95*	57.80*
5 Mos.	213.90*	56.60*	270.50*	197.60*	59.90*	257.50*
1961 Av.	42.78	11.32	54.10	39.52	11.98	51.50
1960 Av.	41.93	12.50	54.43	42.30	12.00	54.30

* Preliminary.

Source of Statistics: National Machine Tool Builders' Assn.



special K-H brake power for every wheel

Installed as original equipment on late model trucks, Kelsey-Hayes' new air-actuated hydraulic braking system provides three extra safeguards for smooth, positive stopping under all driving conditions . . .

1. If rear hydraulic line or wheel cylinder fails, you still have full front brakes with their own power assist!
2. If front hydraulic line or wheel cylinder fails—you still have full rear brakes with their own power assist!
3. If air supply should fail—you still have direct mechanical actuation of full rear brakes!

It's hailed as the industry's safest truck brake! Write for full information. Kelsey-Hayes Company, Detroit 32, Michigan.

KELSEY HAYES COMPANY

World's largest producer of automotive wheels, hubs and drums

OPERATIONAL PLANTS: Detroit, Jackson and Romulus, Michigan; Los Angeles, California; Philadelphia, Pennsylvania; Springfield, Ohio; Utica, New York; Davenport, Iowa; Rockford, Illinois; Windsor and Woodstock, Ontario, Canada.



INDUSTRY STATISTICS

By Marcus Ainsworth, STATISTICAL EDITOR

WEEKLY U.S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending		Year to Date	
	June 24	June 17	1961	1960
PASSENGER CAR PRODUCTION				
Total—American Motors	9,423	9,694	172,704	258,787
Chrysler	2,063	2,047	44,703	47,439
De Soto				15,638
Dodge	4,172	4,168	67,986	230,168
Imperial	138	143	3,486	8,345
Lancer	1,078	1,274	21,237	
Plymouth	4,586	4,680	84,834	143,337
Valiant	3,403	3,167	58,945	148,947
Total—Chrysler Corp.	15,410	15,459	281,191	583,874
Comet	5,224	4,833	84,997	73,833
Falcon	13,146	12,595	242,142	298,474
Ford	17,355	18,878	401,866	585,845
Lincoln	500	620	15,046	11,015
Mercury	2,573	2,842	49,498	89,945
Total—Ford Motor Co.	38,798	39,968	793,649	990,012
Buick	3,979	3,787	86,076	158,109
Buick Special	2,442	2,352	40,939	
Cadillac	3,375	3,385	81,103	87,826
Chevrolet	30,632	30,069	628,390	940,652
Corvair	7,802	7,701	176,306	144,888
Oldsmobile	5,611	5,613	115,453	207,027
Oldsmobile F-85	1,305	1,337	31,642	
Pontiac	5,620	5,736	114,616	248,843
Tempest	2,775	2,838	60,292	
Total—General Motors Corp.	63,639	62,838	1,334,817	1,787,345
Total—Studebaker-Packard Corp.	942	1,318	29,502	63,305
Checker Motors	92	71	2,844	3,917
Total—Passenger Cars	128,304	129,346	2,614,707	3,707,240
TRUCK AND BUS PRODUCTION				
Chevrolet	7,506	7,937	166,232	233,198
G. M. C.	1,431	1,379	33,226	58,963
Diamond T.	58	42	876	1,495
Divco	60		1,088	2,212
Dodge and Fargo	1,835	1,509	32,540	40,357
Ford	6,749	7,024	166,075	194,272
F. W. D.	22	22	414	539
International	3,147	3,168	72,207	68,661
Mack	243	239	4,912	7,622
Studebaker	152	121	3,787	8,349
White	373	390	6,615	9,475
Willys	1,672	4,658	56,714	76,450
Other Trucks	80	80	1,920	2,543
Total—Trucks	22,930	26,769	548,806	704,143
Buses	80	125	1,866	2,033
Total—Motor Vehicles	151,314	156,240	3,165,179	4,413,416

1961 TRUCK TRAILER SHIPMENTS

Industry Division, Bureau of the Census

Type of Trailer	Four Months		
	April	1961	1960
Vans			
Insulated and refrigerated	546	1,838	2,345
Steel	39	193	385
Aluminum	507	1,645	1,960
Furniture	121	381	805
Steel	98	323	715
Aluminum	23	58	90
All other closed-top	1,320	5,369	10,887
Steel	246	1,100	2,463
Aluminum	1,074	4,269	8,424
Open-top	146	584	1,195
Steel	56	202	339
Aluminum	90	482	856
Total—Vans	2,133	8,272	16,232
Tanks			
Non- and low-pressure			
Petroleum and aircraft refuelers			
Carbon and alloy steel	104	330	603
Stainless steel	11	59	91
Aluminum	104	396	752
Total—Petroleum	219	785	1,446
Chemical, food, and sanitary	47	163	234
Dry materials	199	437	657
High-pressure (LPG, chemicals, etc.)	18	130	106
Total—Tanks	483	1,535	2,345
Pole, pipe, and logging			
Single axle	23		91
Tandem axle	46	204	342
Total	69	204	427
Platforms			
Racks, livestock, and stake	23	105	86
Grain bodies	62	237	582
Flats, all types	513	1,670	3,791
Total—Platforms	598	2,012	4,469
Low-bed heavy haulers	240	896	773
Dump trailers	139	503	564
All other trailers	232	959	1,284
Total—Complete Trailers	3,894	14,381	25,094
Dump trailer chassis ¹	67	140	361
Trailer chassis only ¹	185	620	1,364
Total—Trailers and Chassis	4,146	15,350	26,839
Detachable van bodies ¹	198	965	1,051

¹ Sold separately.

NEW PASSENGER CAR REGISTRATIONS BY REGIONS*

Zone	Region	April		March		April		March		Per Cent Change	
		1961	1960	1961	1960	1961	1960	1961	1960	April over March	April over April 1960
1	New England	26,428 ¹	27,020	30,158 ¹	32,339 ²	105,656 ²	105,656 ²	- 2.19	- 12.37	- 12.60	- 12.60
2	Middle Atlantic	106,671	106,873	127,343	359,693	405,896	405,896	- 1.19	- 16.23	- 11.38	- 11.38
3	South Atlantic	65,831	66,642	86,051	249,985	294,673	294,673	- 1.22	- 23.50	- 15.17	- 15.17
4	East North Central	116,821	107,747	163,816	394,946	551,673	551,673	+ 8.42	- 28.69	- 28.41	- 28.41
5	East South Central	20,536	22,528	26,137	77,417	103,602	103,602	- 6.84	- 27.01	- 25.27	- 25.27
6	West North Central	39,345	37,840	54,337	144,853	177,699	177,699	+ 3.98	- 27.59	- 18.48	- 18.48
7	West South Central	34,199	35,498	46,524	143,048	174,335	174,335	- 3.66	- 26.49	- 17.95	- 17.95
8	Mountain	18,169	18,244	23,194	65,947	74,065	74,065	- 4.1	- 21.66	- 10.98	- 10.98
9	Pacific	59,973	67,675	77,472	228,252	270,352	270,352	+ 3.98	- 22.99	- 15.57	- 15.57
Total—United States		467,973	460,067	637,032	1,756,480	2,157,995	2,157,995	+ 1.65	- 23.40	- 18.61	- 18.61

¹ Does not include registrations from Connecticut.

² Three months registrations.

* Compiled from official state records. Data property of R. L. Polk & Co. May not be copied, sold or reprinted without Polk permission.

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va. Zone 4—Ill., Ind., Mich., Ohio, Wis. Zone 5—Ala., Ky., Miss., Tenn. Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D. Zone 7—Ark., La., Okla., Tex. Zone 8—Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9—Alas., Cal., H. I., Ore., Wash.

1961 TRUCK FACTORY SALES BY G.V.W.

As reported by the Automobile Manufacturers Association

Period	6,000 lb. and less	6,001-10,000 lb.	10,001-14,000 lb.	14,001-16,000 lb.	16,001-19,500 lb.	19,501-26,000 lb.	26,001-33,000 lb.	Over 33,000 lb.	Total
First Quarter	150,943	43,699	2,631	6,988	31,468	14,856	5,768	7,416	263,769
April	53,134	14,877	838	2,707	11,449	4,937	2,536	3,360	93,686
Total—Four Months—1961	204,077	58,576	3,467	9,695	42,917	19,793	8,306	10,796	357,627
Total—Four Months—1960	265,390	75,341	4,766	12,631	69,211	27,681	14,616	15,673	483,909

Quantity
PRODUCTION
of
GREY IRON CASTINGS

*
**ONE OF THE NATION'S
LARGEST AND MOST MODERN
PRODUCTION FOUNDRIES**

*
ESTABLISHED 1866

THE WHELAND COMPANY
FOUNDRY DIVISION

**MAIN OFFICE AND MANUFACTURING PLANTS
CHATTANOOGA 2, TENNESSEE**

NEW

PRODUCTION and PLANT

EQUIPMENT

By C. J. Kelly

ASSISTANT EDITOR

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

Maintenance Panel

A SELECTIVE test maintenance panel has been incorporated into the DynaPath-20 numerical control system to provide a means of isolating and testing specific logic areas and functions. Located at eye level, this new panel contains all necessary controls for preventive maintenance testing.

Simplified circuit checking is ac-

complished by progressively isolating each logic area and measuring its marginal operating level. By isolating each function before continuing to the next, any malfunction can immediately be located. The appropriate modular circuit card is then quickly replaced, assuring uninterrupted control and machine operation. *The Bendix Corp., Industrial Controls Section.*

Circle 41 on Inquiry Card for more data

Valveless Torch

PRODUCTION welding and brazing operations can be suitably performed with the utilization of a new valveless welding torch.

Specifically, the new unit differs from other standard dual-hose welding torches in that needle valves have been eliminated from the torch assembly. A gas-mizer is used in conjunction with the modified torch, and flame adjustment is made at the regulators on the gas cylinder or pipeline station. The gas-mizer, located between the gas supply and the torch, closes off the fuel mixture whenever the torch is hung on the hanger arm hook. When the torch is picked up, the flow of gas is started again. The gas-mizer, which can be equipped with or without needle valves, has a pilot light to ignite the torch. *Air Reduction Sales Co., A Div. of Air Reduction Co., Inc.*

Circle 42 on Inquiry Card for more data

Electronic Vertical Single Plane Balancer



In using this balancing machine the operator presses the start button, notes the reference mark location and the amplitude of unbalance, and then presses the stop button. Electrical braking is employed to stop the rotating piece. After returning the part to the position shown by the strobe light, the heavy (or light) spot will show up at 12 o'clock. A switch determines whether the 12 o'clock position indicates a heavy or light spot, depending whether weight is to be removed or added. Drilling to remove weight can be accomplished with the piece in the balancer.

QUICK and efficient balancing of rotors, flywheels or any other rotative part up to 200 lb in weight and 30 in. in dia, is made possible by a newly developed electronic vertical, single plane balancer. (There is an inverse relationship between weight and diametral capacity. For example: when weight is 50 lbs or less, maximum diametral capacity is 30 in.; when weight is 200 lbs, maximum diametral capacity is 13 in.)

This new balancing device employs the strobe light and other operating principles utilized in cradle type and

portable industrial balancers.

The vertical balancer has four potentiometers which permit four separate calibrations of the meter. Thus the calibration for a production run of one size of pulley, for example, could be "saved," and another pulley balanced on the same machine without upsetting the first calibration. Conceivably, in production work, three calibrations would be saved, with the fourth switch position kept clear for job-type work. *Industrial Balancer Dept., Stewart-Warner Corp.*

Circle 43 on Inquiry Card for more data

Manual Truck

FLUSH-BOTTOM crates, cases and boxes, up to 1000 lb, can be loaded and moved to any desired location by one man using a new type material handling unit called the "Crate Mate."

To move a crate that is flush to the floor, the operator rotates the steering handle 90 deg which permits him to slide it to the rear of the truck. He then inserts the truck's special steel "tongue" beneath the object to be moved, and levers back on the handle. This operation raises the crate and allows the operator to push the body of the truck under the load. The handle is then slid back to its original position and locked in place for moving the load.

The Crate Mate is equipped with rollers on the rear surface, where the load rides, to facilitate unloading by a sharp tug on the steering handle. A built-in floor lock holds the truck stationary on ramps or inclines. *Stokvis Multiton Corp.*

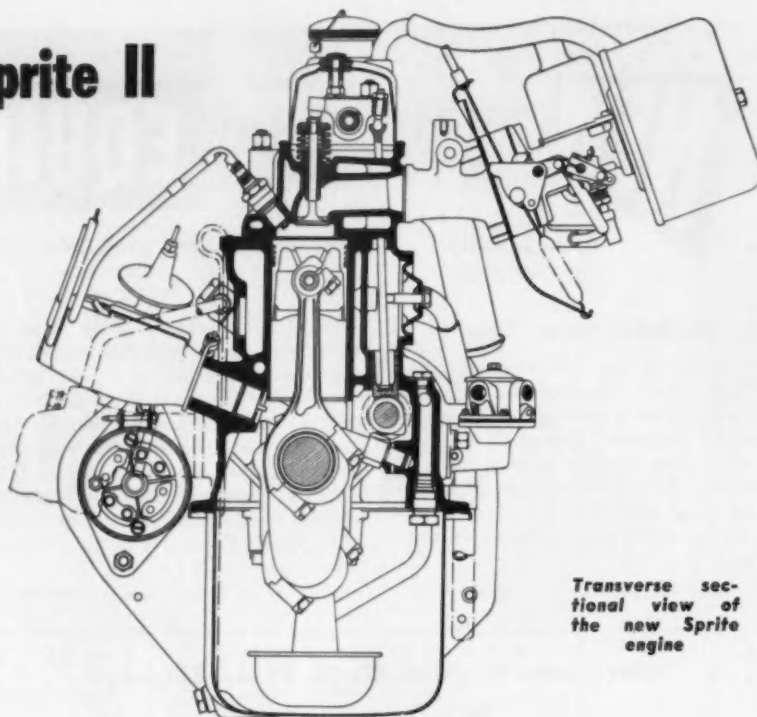
Circle 44 on Inquiry Card for more data

Austin Healey Sprite II

THE Austin Healey Sprite II, recently announced by the Austin Motor Co. Ltd. in England, continues the integral body and frame construction but features improved appearance and 10 per cent more power.

Engine output has been increased by raising the compression ratio from 8.3 to 9:1 and by obtaining better breathing in the upper part of the speed range. Carburetor size has been increased from 1½ in. to 1¼ in., and valve diameter has been increased by 1/16 in. A change in the camshaft gives a longer opening period for the intake valve. As a result of these changes, the engine now develops in excess of 46 hp as installed in the car.

Details of the improved engine are shown in the accompanying illustration.



Transverse sectional view of the new Sprite engine



**ON OUR
WASHINGTON WIRE**

More than 100 applications from depressed areas are being processed by the Area Redevelopment Administration. The first Federal project is expected to be approved in less than 90 days. Though most of the applications being considered now are for public facility loans, requests for loans for industrial and commercial projects are very much in evidence.

A controversial labor bill with much top level backing seems doomed to set the year out on a Congressional shelf. This is the so-called common site picketing measure. Support from President Kennedy, Secretary of Labor Arthur Goldberg and many top echelon Congressmen doesn't seem enough to get action on the bill this year. Opposition from Southern Congressmen and a split in labor's feelings for the bill appear likely to keep it on the shelf. It would permit building trades unions to close down an entire construction job because of a dispute between a contractor and members of any one union at work on the job.

President Kennedy may soon name a foreign trade "czar" to push a reciprocal trade program

through Congress. The "czar" would be a special assistant to the President whose job would be to draft a trade program and try to get it through Congress. Leaning more and more toward protection for U. S. industry, Congress isn't in the mood for tariff-cutting measures the President wants. The "czar" faces a tough task in 1962.

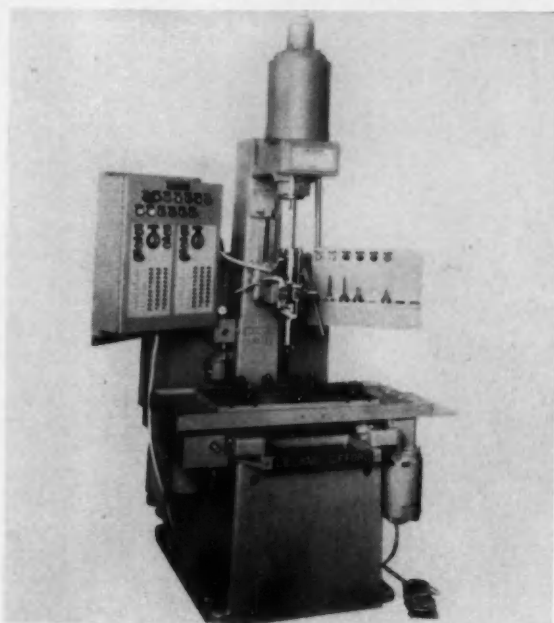
India will receive a \$20 million U. S. government loan for purchase of U. S. aluminum, copper and zinc. The loan will be made by the Development Loan Fund for specific public and private projects in India which require the metals for high-priority purposes. Most of it will be used for the manufacture of electrical equipment and machinery components. The metal is expected to be processed into final form at private plants in India.

Congress is considering a bill which would require a favorable secret ballot vote before unions could call strikes to enforce contract demands. The legislation, introduced by Sen. Karl E. Mundt (R., S. D.), would allow a strike vote to be taken in the 60-day period before a labor-management agreement ends. Mundt's plan would let the workers choose between acceptance of a "final offer" by the company and a strike wherever possible.

President Kennedy plans to use administrative action to aid the depressed U. S. lead and zinc industry. He is thinking of having the government buy \$60 million of the industry's surplus. So far the program has met with mixed emotions. Some believe the plan will increase lead-zinc prices as much as two cents a pound and keep failing mines alive.

(Turn to page 128, please)

New Tape Controlled Drilling Machine



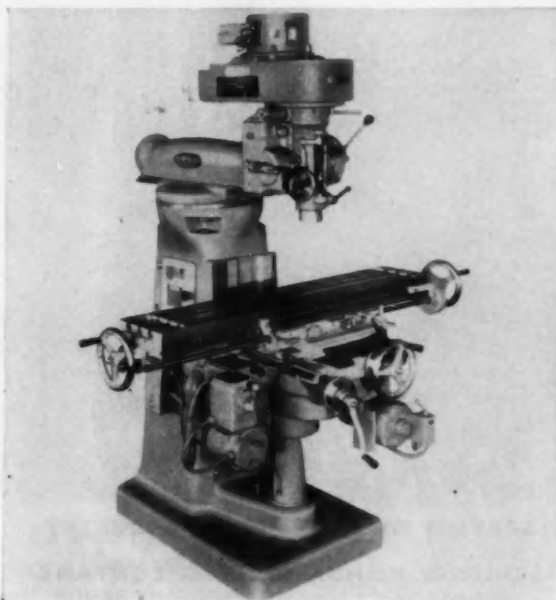
One of the features of this machine is its adaptability to single part, short run or continuous production drilling. Single part operation can be controlled from the keyboard of the G.E. Mark II numerical positioning control or the coordinates can be dialed on the console mounted on the drilling machine. For repetitive work, standard eight channel punched tape is used with a fast tape reader. Program can include automatic reversal for tapping and instant stops for tool and speed changes as indicated by flash tool change lights.

Circle 45 on Inquiry Card for more data

THE compound motion table is traversed hydraulically on ball-bearing mounted and guided round ways with high speed positioning by self-contained, closed loop, hydraulic circuits and reversible G. E. Thy-Mo-Trol controlled motor driven pumps. Positioning accuracy is ± 0.001 in., non-accumulative, with repeatability of ± 0.005 in.

The drilling unit incorporates a highly accurate, sensitive, precision ball-bearing spindle; zero float, quick change chuck; six station turret depth stop and 5 in. traverse hand feed. A choice of spindle speeds in eight steps from 150 to 1800 or 150 to 3600 RPM is available. Drilling capacity is equivalent to $\frac{3}{8}$ in. diameter in cast iron. *Leland-Gifford Co.*

Machine Features Head That Tilts 45 Degrees



The model 645 ram and turret mill has been designed for production runs or tool room use. This new vertical milling machine has a head that tilts 45 deg forward or back and rotates 360 deg on the ram. The turret rotates 360 deg on the column and, in addition, the power assembly rotates 360 deg around the spindle.

The unit has an 18 in. knee travel and a 25½ in. overarm travel for quick setting of any compound work angle. Nine spindle speeds are provided with the standard 1 hp motor and there are three spindle feeds with adjustable depth. *Index Machine Co.*

Circle 47 on Inquiry Card for more data

Precision Lead Bars

ULTRA-PRECISION lead bars and follower nuts for broaching machines, spline grinding machines, special machines and inspection equipment are being produced by a newly developed process.

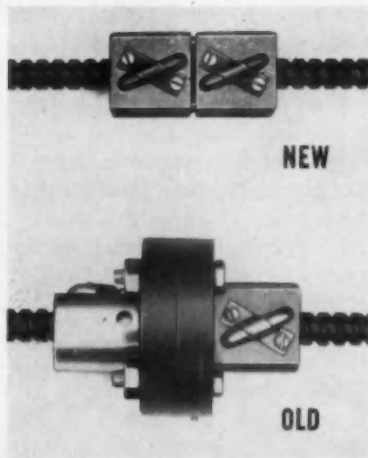
With this method, the helical grooves in the one-piece high speed steel hardened lead bars are ground from the solid on a new specially designed Red Ring precision grinding machine. Leads on 100-in. long bars have been produced to accuracies of less than one thousandth of an in. by the process.

The follower nut is cast on a precision molding mandrel with babbitt metal to provide a backlash-free combination sliding and rotating precision motion. This mandrel is ground with the same machine setup as the precision lead bar. *National Broach and Machine Co.*

Circle 46 on Inquiry Card for more data

Screw Assemblies

BACKLASH of ball-bearing screw assemblies is being eliminated by a new innovation by one leading manufacturer in spring pin preloading operations. Previously, two mating flanges were provided on two ball nuts for each assembly. Shims were assembled between the flanges to obtain the necessary amount of preloading when the flanges were bolted together.



With a recently developed method of spring preloading, space requirements and cost of the assembly have been reduced. In this design, two torque pins backed by springs provide rotational restraint between the ball nuts, while applying a preload determined by the capacity of the springs selected. *Saginaw Steering Gear Div., General Motors Corp.*

Circle 48 on Inquiry Card for more data

**silence,
please...**



No rattles, no squeaks, no wind noises in this car window.

That's the kind of silence you install with Schlegel woven pile liner.

This thick pile runs uniform through the length of the glass channel. It smothers noises before they start.

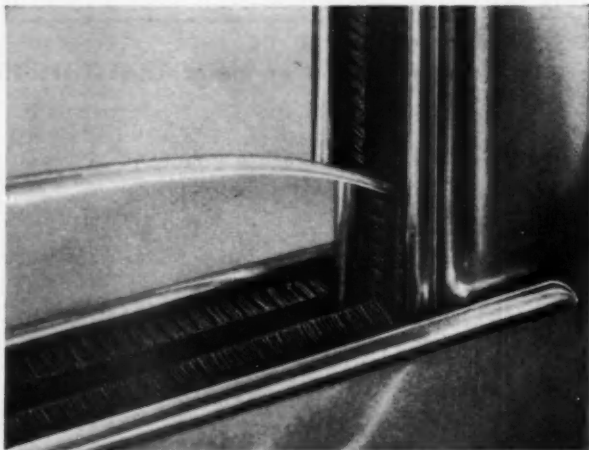
It's a resilient pile. It hugs the surface of the glass tightly—but not so tightly that it restricts window movement.

It's a protective pile. It effectively seals out dust, wind and moisture.

And it's a permanent pile. Each individual strand of pile yarn is interlocked with the woven fabric backing. Thousands of opening and closing actions will not affect this pile. Schlegel pile is a natural seal designed to retain its consistency under all conditions.

Silence? Of course. With proper resilience, density and pile height, a Schlegel woven pile will satisfy the most critical design engineer—but, most of all, dealer and customer satisfaction is assured.

Like to install silence in your automobile windows? Specify Schlegel woven pile in your glass run channels and weatherstripping. They've been used in the quieter cars for decades.



Glass moves friction-free, wet or dry, in this glass run channel with Schlegel woven pile liner.

Schlegel

SERVING THE AUTOMOTIVE INDUSTRY

SCHLEGEL MANUFACTURING COMPANY

1555 Jefferson Rd., Rochester 23, N.Y. In Canada, Oakville, Ont.

Sub Surface to Outer Space



Under or on the surface of the earth, in the air or in outer space, screw threads are vital to man's ability to live, move or work. Strip his inventions of screw threads and he would return to a village handicraft existence. Yes, it would be hard to overstate the impor-

tance of screw threads in our modern world, and equally hard to imagine generating internal screw threads efficiently without taps. If you use either standard or specially designed taps for products on which men's very lives depend, can you afford to use any but the best?

BUY TAPS WITH CONFIDENCE, BUY GREENFIELD TAPS **GREENFIELD TAP & DIE** GREENFIELD, MASS.

Quality metal products deserve "the finishing touch" of Mahon



fine
finishing
for any size,
any volume
product . . .

Mahon has designed, built and installed complete finishing systems for Caterpillar Tractor Corp. (makers of all types of farm equipment) and Scovill Mfg. Co. (major supplier of cosmetic containers).



from giant tractors to small lipstick cases

No matter what your end-product may be, if your production processing requires metal-cleaning, rustproofing or any-type finishing from heavy-duty enamels to sales-stimulating lacquers, you can 'lean' on Mahon's Industrial Equipment Division. Here's an organization with the broadest finishing experience . . . and the one-source capability for planning, engineering, fabricating, erecting and servicing that means quality and efficiency at lowest true cost. Mahon designs industrial equipment but *engineers results from start to finish*. If you are interested in new or improved finishing facilities, Mahon would like to work with you in doing the job right.

WRITE FOR MAHON CATALOG A661.
ALSO IN SWEETS P.E. FILE.

THE R. C. MAHON COMPANY
DETROIT 34, MICHIGAN
MANUFACTURING PLANTS—Detroit, Michigan and
Torrance, California
SALES-ENGINEERING OFFICES—Detroit, New York,
Chicago, San Francisco and Torrance.
Representatives in all principal cities.

YOUR BIGGEST VALUE IS IN MAHON'S PLANNING AND ENGINEERING EXPERIENCE

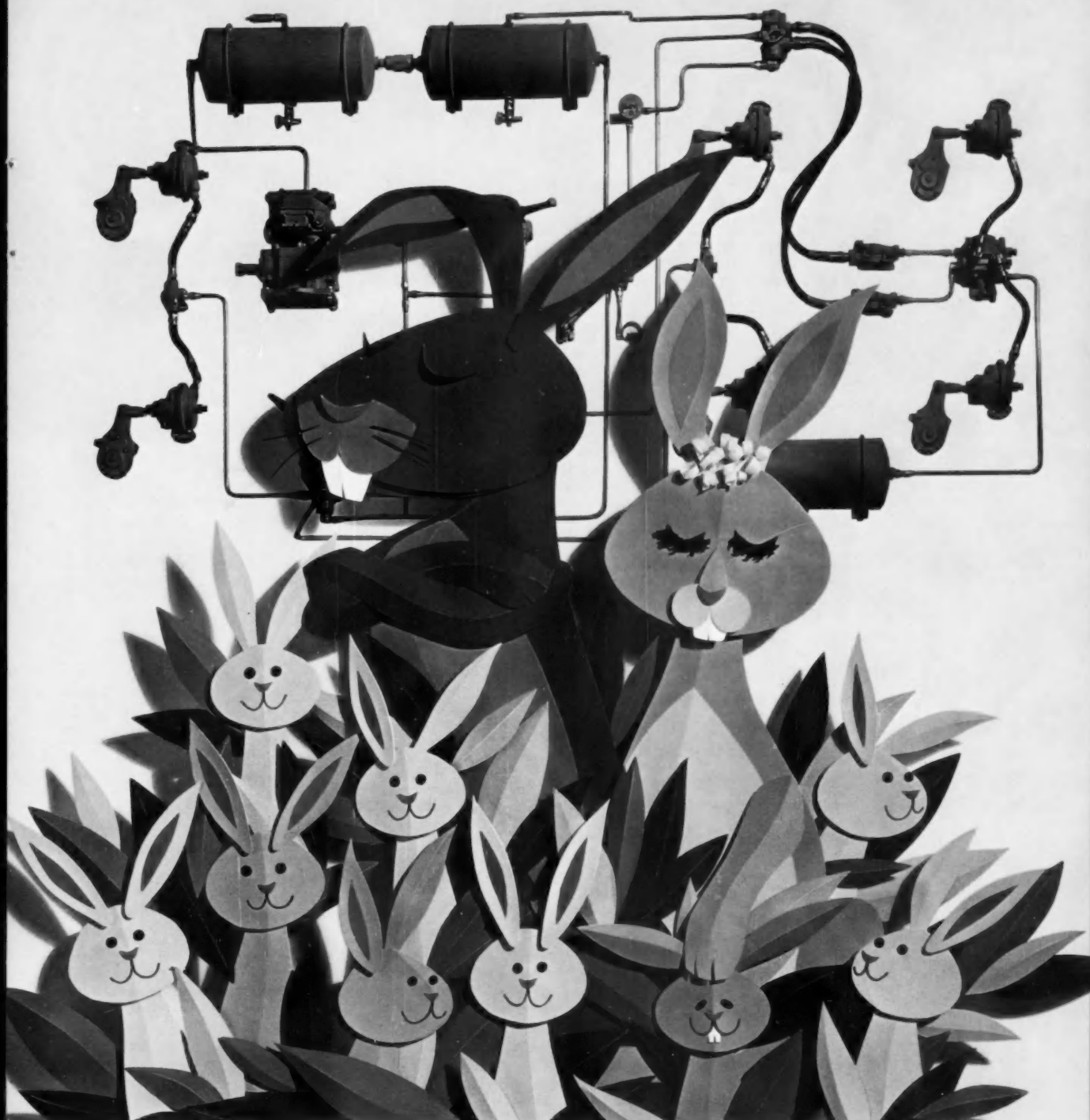
MAHON

MAHON INDUSTRIAL EQUIPMENT

- Complete Finishing Systems • Metal Cleaning Equipment • Pickling Equipment
- Painting Facilities—spray, dip and flow-coaters • Drying and Processing Ovens • Special Process Equipment

MAHON PLANT SERVICES

- Steel Fabrication—weldments, machining and assembly • Structural Steel—fabrication and erection • Rolling Steel Doors—fabrication and erection

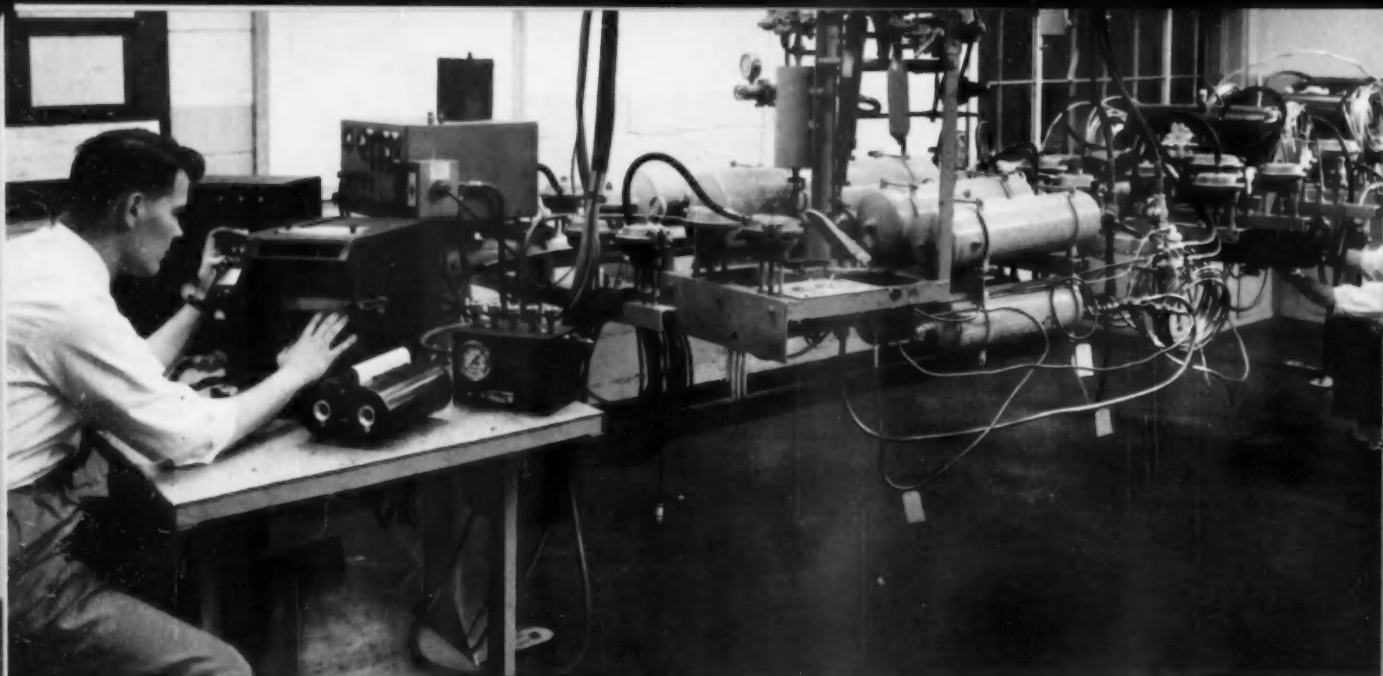


HOW TO MULTIPLY AIR BRAKE VALUE. Rabbits are famous for fast multiplication. When it comes to air brakes, you can multiply the value you get for your dollar by specifying Bendix-Westinghouse. That way, you'll be sure to get exactly the quality, performance, and dependability you want. For, at Bendix-Westinghouse, we always build to high standards rather than just to a price. This policy has been the most important single reason why—in the past 38 years—more truck operators have specified Bendix-Westinghouse than all other makes of air brakes combined. It is a reputation that we will not compromise in any way with our customers. And it's why it will pay you to specify Bendix-Westinghouse Air Brakes—the product and name you can trust.

SPECIFY COMPLETE AIR BRAKE SYSTEMS BY

Bendix-Westinghouse





SPECIAL ELECTRONIC TEST RACK with 18-channel oscillograph evaluates and records application and release times, at various pressure levels, of every brake chamber in the air brake system.

This service is made available by Bendix-Westinghouse to both fleet operators and manufacturers. Portability of instrumentation permits application to road testing.

ENGINEERING LEADERSHIP—THE "UNSEEN COMPANION" OF EVERY BENDIX-WESTINGHOUSE USER

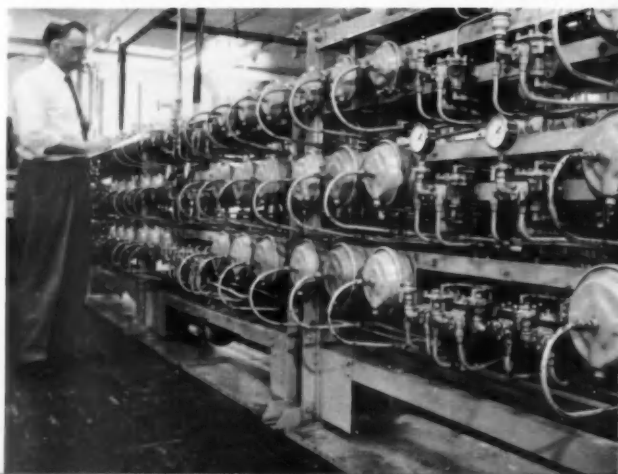
A very ordinary word, engineering. Yet to Bendix-Westinghouse users it has a world of meaning. For our engineering facilities and experience—unmatched in the industry—make the big difference between Bendix-Westinghouse air brake systems and "the rest."

Obviously, the engineering quality built into all our system-engineered products cannot be "seen." But it is there all the same—working every day to assure our users the best in performance, economy, and dependability. In fact, this "unseen companion" is directly responsible for making Bendix-Westinghouse the product and name you can trust.



HUMAN REACTION, the "feel" of various brake valves, system timing, and brake application times are recorded on this test rack.

LIFE TESTS to both experimental and production devices under maximum operating conditions insure product dependability.



Bendix-Westinghouse

AUTOMOTIVE AIR BRAKE COMPANY

General offices and factory—Elyria, Ohio. Branches—
Berkeley, Calif.; Oklahoma City, Okla.; Salisbury, N. C.



NEW

PRODUCTS

AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

By C. J. Kelly
ASSISTANT EDITOR

Trailer Axles

Three new series of trailer axles have been added to an existing line to provide a capacity range of 14,000 to 30,000 lbs. The new models, known as the TH, TR, and the TU series, complete a family of "related design" trailer axles. *Rockwell-Standard Corp.*

Circle 70 on Inquiry Card for more data

Graphite Metals

Cited as a revolutionary breakthrough in graphite metals technology, a new method of combining, or wetting, graphite with metal has been developed. The *Ford Motor Co.* developed the new process.

Iron, nickel, copper, silver, cobalt and alloys of these materials can be combined in combinations varying from 90 to 10 per cent of graphite.

Widespread application of these new materials is foreseen in the fields of self-lubricating bearings, graphite metal brushes, electrical contacts, seals of all types, resistance elements and nuclear applications. The materials are particularly adaptable to situations where unique electrical qualities are required. The materials will have low friction characteristics and are self lubricating.

Intimate bonding between graphite and metal is fully accomplished under the new process. Graphite metal compositions, produced by the new techniques, exhibit greatly improved mechanical and electrical properties. The usual brittle characteristic of graphite is greatly reduced in some compositions and eliminated in others.

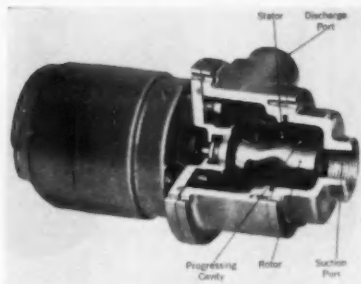
The initial evaluation indicates a transverse rupture strength up to 50,000 psi, and compressive strength up to 120,000 psi. The material exhibits a pressure value up to 200,000 as compared with standard self lubricating bronze of approximately 25,000. Some compositions of graphite and steel are heat treatable by conventional techniques. Exclusive licensee under the Ford patents to produce the new materials is *Dixon-Sintaloy, Inc.*

Circle 71 on Inquiry Card for more data

Motor-Pump Units

Motor-pump units, suitable for use on automotive and ground support equipment, are being marketed for OEM applications. These pumps handle ethylene glycol and similar coolants at a temperature range of -65 to 175 deg. F.

At present there are three models in the line—one basic pump coupled with three Robbins and Myers universal motors of 6, 12, and 24 volt



design, available with or without radio suppression. Deliveries range from 0.4 gpm at 10 psig to 4.5 gpm at zero pressure with each of these 1/20 hp motors. *Moyno Pump Div., Robbins and Myers, Inc.*

Circle 72 on Inquiry Card for more data

Nut & Bolt Lock

A special sealant has been developed to provide a liquid-lock for nuts, bolts and fasteners of all kinds. Called Loctite, this sealant is an "anaerobic polymer." In operation, the resin penetrates the small clearances between assembled metal parts, then self hardens into a tough bond which makes the assembly impervious to vibration loosening. The self-hardening process is activated by metal in the absence of air—which keeps the resin liquid.

According to the manufacturer, some grades of the liquid-lock are so strong they have replaced welding, brazing or soldering. Other grades replace lock-nuts, lock-washers, safety wire, press fits, and other friction fasteners. *American Sealants Co.*

Circle 73 on Inquiry Card for more data

Electrical Laminates

Cimclad is the name of a new reinforced electrical laminate designed for printed circuitry. According to the manufacturer, this copper-clad laminate provides the high tensile, flexural and impact of glass fibre reinforced plastic at a price competitive with other types of circuit boards.

Other features of the new development are good insulation resistance, low moisture absorption and breakage resistance. Cimclad is reported to be easy to process and will cold punch well at room temperatures. From the flammability standpoint, it is self-extinguishing. *Cimastra Div., Cincinnati Milling Machine Co.*

Circle 74 on Inquiry Card for more data

Industrial AC Welder

An industrial welder has been developed to meet the needs for mild steel hand welding in automotive construction and maintenance. Wired to operate from 230/460 V, 60 cycle supply, it has a nominal rating of 500 amps at 40 load V, 60 pct duty cycle, 74 V open circuit.

The new unit is weatherized to provide uninterrupted service indoors or out. *Westing-Arc Dept., Westinghouse Electric Corp.*

Circle 75 on Inquiry Card for more data

Self-Locking Cable Straps

Plastic cable straps for securing cable or wires to sheet metal surfaces in original equipment can be inserted into blind mounting holes. The straps can be securely locked by thumb pressure without the use of tools.

High electrical protection, corrosion and vibration resistance are some of the features of the fasteners. The installed strap hermetically seals the mounting hole. Straps to fit various sized mounting holes and numerous sizes of cable and wire are available. Special size or application straps can also be developed. *Budwig Mfg. Co.*

Circle 76 on Inquiry Card for more data



Capitalizing on man's desire to own his own business, two brothers parlayed an ice cream truck into Mister Softee, an international mobile soft ice cream franchise corporation in just a few years. In 1955, William A. Conway, a certified public accountant, and his brother, James F. Conway, a salesman, pooled their savings and borrowed some money from their cousin, Patrick Cavanaugh, Philadelphia restaurant owner. They built a small truck equipped as a mobile soft ice cream unit. All that summer, the Conways sold their delicious soft ice cream in Philadelphia.

Later, incorporated as Mister Softee, they assembled six more units and sold them to dealers on a franchise basis. The combination of the management know-how of the Conway brothers, sparked by the efforts of unit owners happy to be in business for themselves, proved irresistible. Business boomed and today Mister Softee has over 2,000 franchised mobile units in 37 states, England, Puerto Rico, The Virgin Islands and Canada. In 1960 dealers' sales of ice cream products topped \$30,000,000, and dealers' profit on a single mobile unit ranged around \$8,000.

USS Cor-Ten
Steel
rings
the bell
for
Mister Softee

How about the trucks? They are marvels of efficiency . . . built light and strong with bodies and frames of USS COR-TEN High-Strength Low-Alloy Steel. The first ones are still in operation. All were made by Boyertown Auto Body Works, Boyertown, Pa. The units are about 500 to 700 lbs. lighter than carbon steel construction . . . but COR-TEN Steel's high corrosion resistance makes them more durable. There's less maintenance, too . . . and the colorful paint jobs last twice as long on COR-TEN Steel and retain their fresh look despite frequent washings and exposure to the elements.

USS COR-TEN Steel is saving money for hundreds of fleet owners whose trucks take a real pounding. For more information on USS COR-TEN Steel, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pa. USS and COR-TEN are registered trademarks.

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This mark tells you a product is made of modern, dependable Steel.

United States Steel



Mounting Screws

Mounting screws have been introduced in a new line with two standard head designs. The wafer and flat head are designed to eliminate the need for countersinking. The new screws have multiple thread left-hand retaining sections and torque increasing "nibs" under the head to prevent stripping and to eliminate the need for retaining nuts. *Shakeproof Div., Illinois Tool Works.*

Circle 77 on Inquiry Card for more data

Passenger Tire

A premium passenger tire that has polybutadiene synthetic rubber in the tread combines new principles in design, new materials and new processing techniques, according to the manufacturer. The polybutadiene rubber was selected for its abrasion resistance. The new polymer is blended with styrene butadiene. The company report said the tread on this tire, called the U. S. Royal Master, is 20 pct deeper than standards set by the Tire and Rim Association.

The Royal Master is a low-profile, tubeless tire made in both nylon and rayon cord construction. *United States Rubber Co.*

Circle 78 on Inquiry Card for more data

Anti-Flame Foam

A non-burning flexible urethane foam has been developed for application to products and areas which are subject to flammable conditions. Anti-flame, as it has been called, is not only self-extinguishing but even flammable material such as paper is self-extinguishing when bonded to it, the manufacturer reports. *Plastomer Corp.*

Circle 79 on Inquiry Card for more data

Welding Rod

A NEWLY introduced silicone-bronze welding rod, suitable for use with tungsten inert-gas, carbon arc and oxyacetylene welding processes, has been designated Airco 1010. In addition to use on silicone-bronze wrought and cast materials, the new rod has many applications employing plain and galvanized steel.

The rod is available in 36 in. lengths and diameters from 1/16 to 5/16 in. *Air Reduction Sales Co., A Div. of The Air Reduction Co., Inc.*

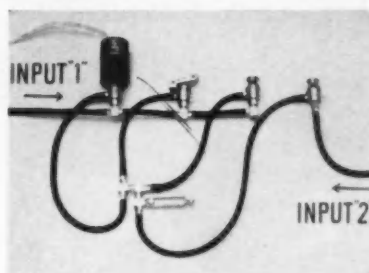
Circle 80 on Inquiry Card for more data

Double Check Valve

A new miniature shuttle, or "double check" valve, only 3/4 in. overall size has been developed for use in multiple fluid power circuitry of cylinders, controls and safety devices.

Alternate flow from two inputs to a single output, but never to other input, is accomplished thru use of a sliding piston with Buna-N seals. Exhaust is always thru the input port where pressure was last applied.

The photograph shows how any number of shuttle valves can be joined together to actuate one cylinder with valves controlled by solenoids, cam followers or manual push



buttons from one pressure source (input "1"), or different pressure sources (input "2"). These units are especially useful for "inching" operations, safety devices or other multiple circuitry applications where savings of space and weight are necessary. *Clippard Instrument Laboratory, Inc.*

Circle 81 on Inquiry Card for more data

3-Speed Truck Axle

A three speed tandem truck axle has been developed. When used with a five speed transmission this axle provides the operator with 15 forward speeds. The value in this axle is that for each transmission gear the driver will have three very close gear steps—low, intermediate and high—to give him a broad selection of the best gear ratio for the terrain and the load the vehicle is carrying.

A feature of this three speed axle, when used in conjunction with a five speed transmission, is fingertip selection of gears. The conventional knob of the five speed transmission is replaced by a newly developed knob which contains a three position switch for low, intermediate and high axle shifting. The lever controlling these positions can be moved by use of the driver's thumb or index finger. *Axle Div., Eaton Mfg. Co.*

Circle 82 on Inquiry Card for more data

Custom-Built Filters

Filters capable of operating at altitudes of 50,000 ft. at temperatures of minus 65 to plus 250 degrees F at a fuel flow rate of 14,300 PPH and made to "pop up" a little red flag when the differential pressure across the filter assembly increases to a predetermined level were custom-designed for the new B-52H long range bomber which took to the air for the first time early this year.

Each of the eight fuel filters contains a filtering element or medium—the material which performs the actual filtration—of 360 sq in. of convoluted stainless steel woven wire cloth in a space measuring 7 3/4 long by 3 3/4 OD. This one element and its entire filter housing weighs 6.5 lb. *Purolator Products, Inc.*

Circle 83 on Inquiry Card for more data

New Differential

A new differential has been designed to provide efficient use of engine power for automobiles, trucks, buses, off-the-road, farm, and military vehicles. The new dual drive full time differential consists of two basic operating parts—a balancing gear and a side gear.

In operation, worms on axle shaft mesh with worm wheels to assure positive drive under all conditions. The worm wheels are interconnected by balancing gears for exact power division on turns. The new unit has no clutches, springs, locks or manual controls. *Dual Drive, Inc.*

Circle 84 on Inquiry Card for more data

Precision Machine Vise



Super Vise is the designation of a new precision machine vise for industrial use. Multifirm profiles are ground into the hardened tool-steel jaws to grip a variety of shaped materials. The jaws can be positioned to hold rounds, squares, vees, tees, etc. The manufacturer reports the unit will hold thin wall tubing without distortion. *C. H. Staefling Co.*

Circle 85 on Inquiry Card for more data

Architects of the Automotive Future

(Continued from page 76)

tion of the human body with respect to the vehicle is the other consideration.

We know that the most beautiful car design, without the proper seating and interior comfort, is of little value.

Mr. Najjar: The desire to own

a particular car may derive largely from its appearance. Once the car has been purchased, its owner should continue to like it because of the planning and execution that went into it.

The design of seats, the position and shape of controls, and the location and legibility of instruments, receives a tremendous amount of highly detailed attention, and it is the sum total of this intensive effort that establishes the final effect of the car on the consumer.

Dimensional check on 7 planes in one set-up!

Faceplates from 12" to 84" in diameter



Up to 50% savings in time and manpower

Every angle, diameter, line, critical surface on 7 V-block planes is completely checked without disturbing the initial set-up. Previously a two-man operation . . . now, with motor-powered, push-button tilting and rotation offered by the ROTAB precision positioning table, one man quickly, accurately runs the entire inspection in about half the time. This is how ROTAB is paying off for a major diesel engine manufacturer . . . ROTAB will pay off for you, too. Write for details.



MACHINE PRODUCTS CORPORATION
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Mr. Tarabusi: I think the first pleasure of owning an automobile is enjoying the styling and the basic appearance of the car. This aspect is satisfactory, then the second pleasure comes from the actual comfort of using the car for whatever means the consumer has in mind.

Discoveries of Science as Factors

Mr. Hopkins: Please, gentlemen, cite an example on the use of new discoveries of science by modern automotive designers.

Mr. Jordan: At GM Styling we are continually aware of new discoveries of science that may apply to the design of a vehicle. Many of our advanced prototype vehicles as a matter of fact, take advantage of these new developments and are tested on an experimental basis. Since we cannot, for security reasons, talk about these vehicles, here are some examples from the past.

The discovery of new polyester resins made possible plastic automobile bodies which first appeared in 1953 on the Chevrolet Corvette. General Motors designers recognized the advantages offered by fiberglass bodies and decided that this material would make an ideal sports car body because of its high strength to weight ratio, its ease of repair and resistance to corrosion.

Today, nine years after its introduction, the fiberglass Corvette body has proved the success of fiberglass as a practical, workable material in low volume production lines.

In addition, General Motors' styling pioneered the use of fiberglass in the construction of styling prototype models and show cars. Previously, models of proposed designs were hand formed from metal and wood. This time consuming and costly process has been replaced by a much faster and more efficient system whereby a plastic cast is taken directly from an accurate clay model of the design, fiberglass is molded in the plastic cast, and the panels are assembled on a dummy chassis with both interior and exterior features combined into a single show model.

Now the automobile designer can get a quick and accurate pic-



"Paper phenolic sandwiches"

seal the contents of automotive condensers. CDF mass-produces insulating caps, using a paper phenolic laminate core of high dielectric strength and mechanical rigidity carefully bonded between two layers of rubber. High speed machines punch out the caps to close tolerances.

Result: For the automotive industry, a large volume source of reliable, economical insulating caps . . . one of the many quality products manufactured by CDF.



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AUTOMOTIVE INDUSTRIES, July 15, 1961

2

NEW HIGH PERFORMANCE TOOLS JOIN AIRETOOL LINE...

1

Rugged, air-powered, reversible impact wrench; 1/2" bolt capacity; unitized construction; low torque; two models.



2
400-T sheet metal tapper; runs at 400 rpm; rugged construction; reversible; muffled air motor; lightweight, easy to handle.

Where production demands are highest, you'll find Airetool fastening and production tools meeting or exceeding requirements, and the new 625 and 626 impact wrenches and 400-T tapper are no exceptions. Airetool's complete line of quality, job-proven, pneumatic production tools includes nutsetters, screwdrivers, drills and grinders. When you want production . . . you need Airetool.

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REPRESENTATIVES in principal cities of U.S.A., Canada, Mexico, South America, England, Europe, Puerto Rico, Italy, Japan, Hawaii.
CANADIAN PLANT: Brantford, Ontario.
EUROPEAN PLANT: Vlaardingen, The Netherlands.

Circle 148 on Inquiry Card for more data

ture of his design as it will appear and can make changes quickly and easily.

Mr. Najjar: At Ford we appear to be on the brink of having available a number of new plastic materials and processes that have been in the experimental development stages for some time.

Future car interiors may very well be a symphony of sculptured forms in a wide variety of textures and finishes. Such interiors might be built around a foamed plastic shell with high density plastics again providing surface film.

The most widely used examples of this approach at the moment are crash panels, sun visors and arm rests. However, we soon may see complete seats designed through an extension of this principle.

Mr. Teague: The most recent so-called scientific discoveries that are applied to automotive use today are utilized primarily in the interior area of the car. These include modern tough synthetic fabrics and vinyls which may all but eliminate the animal-based fabrics of the past such as wools and silk.

The exclusive use by American Motors of the fiberglass headlining in our '61 models is certainly a good example of putting a scientific development to work. This very new application of a new material was immediately recognized by styling as an excellent styling feature and a product improvement. After the first mock-up installation, it was definite that the appearance factor alone was so superior to the old system of sagging, dirt-catching, loose, frayed headlining, that we felt we had to incorporate this feature into our automobiles.

Other Factors

Mr. Hopkins: Please cite one example of any other consumer benefit created and developed by automotive designers for the modern vehicle user.

Mr. Najjar: A look at the cars of today, compared with the cars of yesterday, will illustrate that the automotive stylist has, through his natural efforts toward creating beauty, provided the consumer with many tangible and intangible benefits.

Mr. Tarabusi: A major benefit

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ELECTRICAL PROPERTIES UNIMPAIRED

Die stamped circuits are produced by a dry technique which employs a heated metal-cutting die to delineate the conductor pattern and bond it to the base material by activating the adhesive between the metal foil and the insulating material.

The electrical properties of the base material are unimpaired, because no chemicals are used, and there is no adhesive residue or residual metal on the insulating surfaces. This gives the designer the advantage of selecting base materials for physical and electrical properties without considering chemical resistance.

A new booklet, "Designing with Dytronics Die Stamped Circuits," will help you evaluate and design with die stamped circuits. Write for your free copy today.



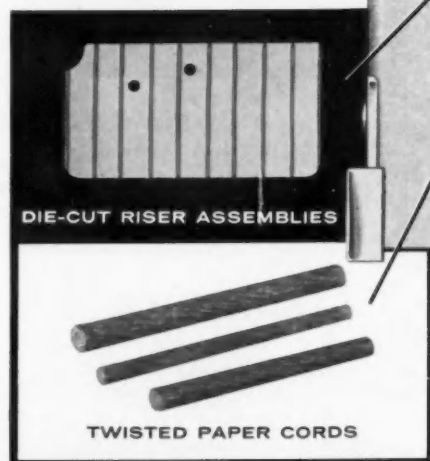
Dytronics
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*...and hundreds
of other stock and
custom materials
for functional or
decorative interior
body use!*

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**SOLVES YOUR INTERIOR BODY
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As suppliers to every major passenger car manufacturer, Sackner has developed a wide range of products for upholstery, padding and trimming automotive body interiors. Most of these were engineered to fill a specific need . . . to solve a particular problem. We have 45 years experience . . . all the necessary know-how to engineer fibre and plastic material to meet your need . . . let our experienced Product Development Staff assist you! Submit details of your requirements, today, for free analysis and recommendation.

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- **NON-WOVEN PADS** Dielectric, non-dielectric . . . needed or non-needed pads for door panels, kick pads, etc. Stock or custom specifications. Natural or synthetic fibres.
- **WOVEN PAPER FABRICS** Tough, durable, attractive fabrics of twisted paper cord, for package trays, trunk liners, headliners, etc.
- **TWISTED PAPER CORDS** Perfectly uniform diameter for a neat, trim welt every time . . . twisted kraft, creped tissue or braided cords. Rugged durability at low cost.
- **DIE-CUT RISER ASSEMBLIES** Pre-formed, pre-assembled panels, die cut to exact shape for padded doors, etc. Rich quilted design effects . . . low installation cost.
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- **PLASTIC EXTRUSIONS** Decorative trim or functional parts in any shape, length, size, color or degree of hardness specified. Complete engineering service.
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2161 SACRAMENTO STREET 1-4

to the consumer from the automotive designer is establishing styling trends that affect many phases of our lives. Automotive design and styling concepts find their way into the design of many consumer, recreational and industrial products, even in architecture.

Mr. Teague: Just as the research or advanced chassis and power plant engineers are continually experimenting with new and advanced suspension and engine developments, so is the stylist and

designer creating, sketching and modeling new forms, shapes and proportions, continually search for new and fresh design approaches to offer the car-buying public vehicles that will be as contemporary and as practical as today's dream homes.

Mr. Jordan: Many of these things that we have been talking about come under this heading of consumer benefits. For example, human engineering contributes to consumer benefits by making auto-

mobiles fit a wider range of users.

Color coordinated interiors make automobiles more pleasing which improves the physical environment within the motor vehicle. Lower hood surfaces and more glass improve visibility. Aerodynamic shapes and lower cars improve handling and overall safety.

And, of course, these improvements also add to the overall appearance. Beauty in the car increases pride of ownership and we feel that this is an important customer benefit.

All these factors contribute to an increase in customer benefits and all resulted from the automobile designer's constant dissatisfaction with things as they are and his refusal to rest on past laurels. In his way, an automobile designer acts as a stimulus for progress, which, in turn, brings more benefits to modern vehicle users. ■

1 or 1,000,000



—every
PALNUT®
FASTENER
is
Dependably Uniform

You can depend on PALNUT fasteners to meet every specification—every shipment. PALNUTS are precision-produced in huge volume at low cost—inspected at every step of production.

You can depend on PALNUT deliveries, too. High-capacity facilities, large stocks, plus systematic follow-thru at our Detroit office and warehouse, as well as the home plant, keep shipments moving on schedule.

Are you making fullest use of PALNUT fasteners? There are many styles, in a wide variety of finishes, including 3M Mechanical Zinc to meet the most rigorous salt spray tests. Call in a PALNUT fastening engineer—or write for catalogs.

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40 Glen Road, Mountainside, N. J.

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LOCK NUTS and FASTENERS



Above: Detroit office and warehouse.



Left: Big, modern plant at Mountainside, N. J.

EPOXIES

(Continued from page 71)

acids under the influence of heat.

As a family, they combine such excellent properties as flexibility, adhesion, toughness and excellent resistance to detergents and alkalies, mild acids, aromatic and aliphatic solvents.

Short-oil coatings (extent of modification with fatty acids) are normally cured by baking on the production line, and longer-oil formulations are generally air dried.

Overall performance on steel surfaces is often obtained by using epoxy primers under an alkyd topcoat.

Modified epoxy ester baking coatings based on solution blends of drying tape esters with melamine are also reported in limited use. These esters provide improved hardness and resistance to chemicals and slightly better initial color retention.

Chrysler, as part of its rust-proofing program, applies an epoxy primer (reportedly an alkyd-epoxy combination) to the interior of the body sills beneath the doors. Two coats of epoxy primer are also used externally as part of the nine-step finishing operation. ■



COLD DRAWN

Get all the advantages—find out how much faster—better—you can do with Inland Ledloy® steels. Go ahead...we mean it...clobber it!

■ Push your machines as far as they'll go, then see for yourself—speeds and feeds like you've never seen before—the easiest tolerance control you've ever had—greater production per tool change than you ever thought possible.

■ Inland pioneered in the production of leaded steels—has worked hand in hand with metal-

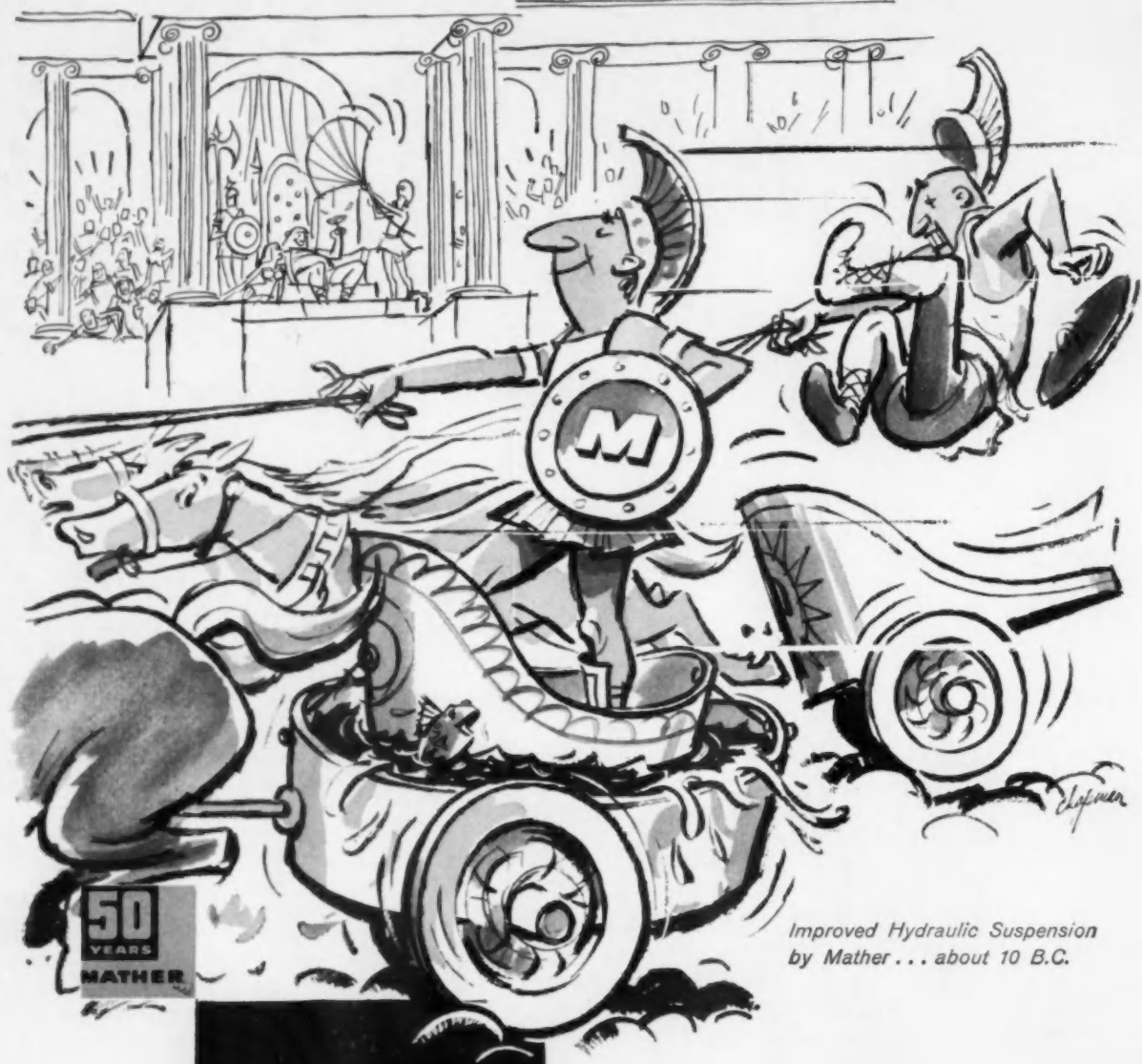
working shops to achieve the finest, most machinable steels in the world. Send today for your free copy of the booklet, "Properties of Ledloy Steels," and be sure you use Inland Ledloy leaded steels—you can count on them because they're backed up by more than 20 years of continuous research, development and practical experience. Ledloy steels are available from your Cold Drawer or your local Steel Service Center.

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SOLVE
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SUSPENSION
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Please pardon the slight exaggeration . . .
Mather is really only fifty years old but during
these years, we've gained a "heap" of
suspension knowledge.

Mather has the experienced manpower, the
research, design and manufacturing facilities to
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A CHALLENGE AND AN INVITATION

- If you've got an acceptable suspension idea with
- a funny situation that you'd like cartooned ...
- send it in ... it might be selected for a future ad.



THIS OIL RING PROMOTES YOUR SHOP'S REPUTATION
It's Stainless Steel...it's for all Rambler models



Rambler dealers have the answer to the oil control problem, boxed and ready—American Motors KromeX replacement ring sets with Sealed Power Stainless Steel oil rings.

Your overhaul know-how and Stainless Steel oil rings are a winning combination. Stainless Steel rings hold their fit in the cylinder and retain tension at

high temperatures. They have chrome-plated side rails for extra long life, seat instantly and are a snap to install.

Chrome-plated compression rings give positive blow-by control, long life and are preseated at the factory for instant seating. Get American Motors KromeX ring sets with all these advantages from your Rambler dealer.

Manufactured by **Sealed Power Corporation** Muskegon, Michigan

Numerically Controlled Machine Tools

(Continued from page 72)

ture, and a center-punch mark is used to indicate the center line and starting position for indexing. The machine mills flats on the No. 1 and No. 4 counterweight of the 4-cyl. crank, two pads on the No. 1 and No. 4 checks, and a strip on the outer edge of the pin of each. The

same procedure is followed with the 6-cyl. crankshafts, except that the locations are different.

Allis-Chalmers Mfg. Co. has recently installed a DeVlieg Spiramatic Jigmil horizontal boring and milling machine, with an eight-channel tape control, at its West Allis Works for machining final drive housings on its new compact crawler tractors. Commands from the control unit move the machine head vertically on the column, also control movement of the table horizontally, and movement of the

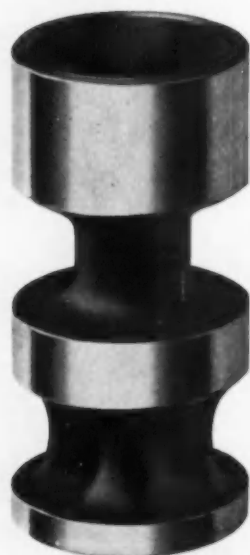
spindle in and out of the sleeve. All controls are point-to-point.

The cast iron housings are made in right and left hand models. On the pinion axis are the seal diameter, 4.499 in., plus 0.001, minus 0; the bearing diameter, 4.330 in., plus 0.001, minus 0; bearing diameter at the far end of the axis, 2.998 in., plus 0.001, minus 0; and two snap ring and one O-ring groove, made with expanding cutters. Three cutter bars are used in this operation, the first roughing the three diameters, the second finish machining the same diameters, and the third cutting the three grooves. On the axle axis, a seal diameter is cut to 4.499 in., plus 0.001, minus 0; the bearing diameter to 4.330 in., plus 0.001, minus 0, and the bearing at the far end of the axis to 2.998 in., plus 0.001, minus 0. Grooves for two snap rings and one O-ring also are cut. As before, rough and finish cutter bars are used, and a separate bar for cutting the grooves.

Finally, a stub bar bores out a locating hole for the transmission to 7.000 in. diameter, plus 0.005, minus 0.

All users report themselves pleased with the performance of the numerically controlled machines. International Harvester's Melrose Park plant already has installed four more machines—a Giddings & Lewis vertical boring machine with Cincinnati-Bickford head, and with Giddings & Lewis controls; a Lucas horizontal boring machine, using General Electric controls; a DeVlieg Spiramatic Jigmil, for use in experimental work, and an American drilling and boring machine, for chassis parts for tractors. The company is planning to install numerically controlled machines in other plants also. ■

NEW!



SKEL KAST

This latest tappet improvement represents still another advancement brought about by the constant search for better design, materials, and manufacturing methods at Johnson Products. The reason? *Better tappets are our only concern.* We welcome the opportunity to put our engineering and test facilities at your disposal. Johnson Products Inc., Muskegon, Michigan.

BOOKS...

MAGNETIC CONTROL OF INDUSTRIAL MOTORS (PART I), A-C CONTROL DEVICES AND ASSEMBLIES, by Gerhart W. Heumann, published by John Wiley & Sons, Inc., 440 Park Ave., South, New York 16, N. Y. Price, \$9. Primarily an application book, it carefully analyzes controllers for industrial type A-C and D-C motors. Each type motor is given full treatment in conjunction with its associated controllers.

MANUFACTURERS' NEWS

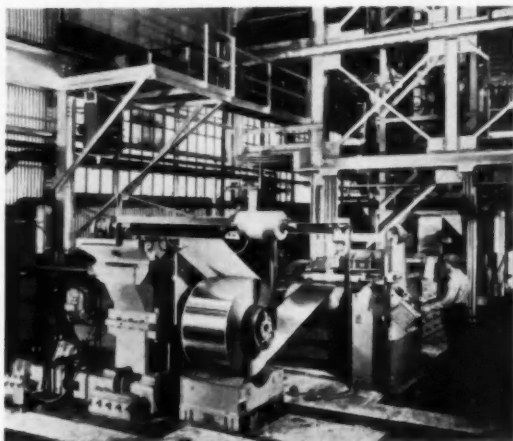


P-H Alabama Plant

Parker-Hannifin Corp. has opened a plant in Huntsville, Ala., to service its line of fluid system components for space vehicles. S. B. Taylor, president, said the Huntsville facility would be operated as a department of the Parker Aircraft Div., Los Angeles, manufacturers of other components for space, missile and aircraft programs.

Delco Radio Expands

A 150,000 sq ft manufacturing building for semiconductor products is planned for the Delco Radio Div. of General Motors Corp. in Kokomo, Ind. Completion is expected by May 1, 1962. The air conditioned one-story building will be of brick and steel and will be east of the new research and development building.



Interior of new bright annealing line at Sharon Steel Corp.'s Roemer Works, Farrell, Pa., where stainless steel strip is processed in endless stream for coiling and shipment to automotive manufacturers. The new finish is said to eliminate fabricators' need for costly buffing and pickling operations.

Students Hear Executive

"Ability to transfer experience to a new problem, basic knowledge of words and personal communications are fundamentals for industrial executive material," Theodore F. Walker, executive vice president, Kent-Moore Organization, told industrial management students at Purdue University. Describing the type of management trainee most in demand by industry, Mr. Walker emphasized the need for a broader education experience highlighting English, Mathematics and the Humanities.



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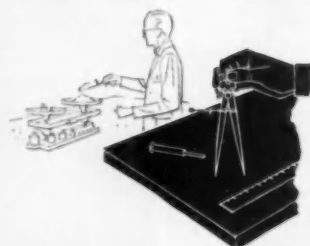


Today, no matter what the exact requirement of the job, there's a Continental Red Seal model—gasoline, Diesel, or LPG—engineered and built to meet it down to the last detail. In the transportation field alone a broad range of basic engine models—26 to 300 horsepower—assures PRECISE power for heavy-duty highway trucks and tractors, both as original equipment and as replacements for other makes—in buses, taxicabs, door-to-door delivery vehicles, transport mixers and the like.

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Corporation**
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Circle 156 on Inquiry Card for more data

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Production Techniques

(Continued from page 77)

are employed to form the water jacket, header, and intake and exhaust ports of the cylinder heads.

The most important properties of cores for aluminum castings are good collapsibility to permit easy removal after casting, coupled with low gas evolution during the casting process. For that reason, a special urea sand mixture was developed and is used for aluminum coring. These cores can be made with conventional core mixing and blowing equipment and baked in conventional core ovens.

At Defiance, core sand is mixed with urea formaldehyde, clay and water in a muller, and discharged into a belt conveyor system that transfers it to a silo. Sand is taken from the silo and transferred to core blowing machine hoppers by motor-driven wheelbarrows. Conventional semi-automatic core blowing machines are used to form the cores. They are automatically stripped onto driers and baked in vertical core ovens. Baking time is dependent upon the cross sectional area of the core. After baking, the cores are processed, gaged and placed on racks for delivery to the aluminum molding area.

Aluminum molding operations are performed on raised platforms with belt conveyors under the platforms to remove the castings. A continuous conveyor carries cores to all molding stations.

Unique features of the molding technique include pouring of the block casting in a vertical position rather than in horizontal position, and complete temperature control of metal permanent molds. All sections of the metal molds are water-cooled, with thermocouples relaying temperature information to a master recorder on a control panel.

Elaborate gages have been developed to check mold alignment and core locations in the hot and cold state during initial setup and operation. Urea sand cores are gaged in the molds to insure proper location, and vents have been provided to allow core gas escape.

Pre-cast grey iron cylinder liners are heated and located on retract-
(Turn to page, 109, please)

Circle 158 on Inquiry Card for more data

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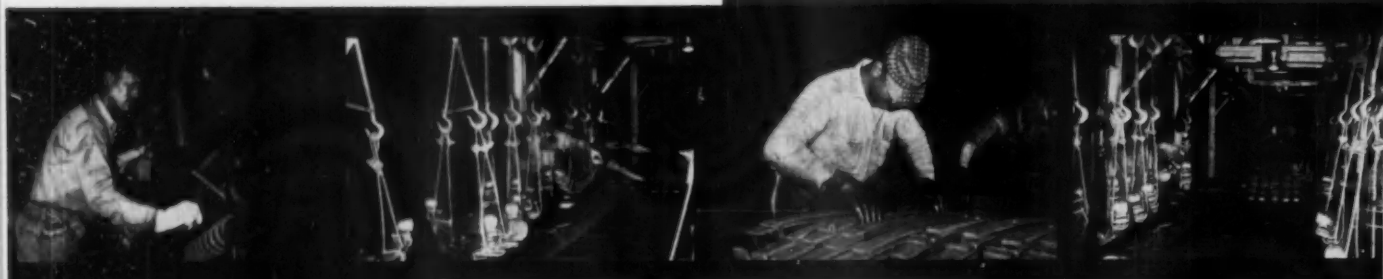
McQuay-Norris bearings are made to S.A.E. specifications. They are precision designed to give superior service... cooler running... better heat transfer.

For stronger and longer bearing life, you can depend on McQuay-Norris bearings.

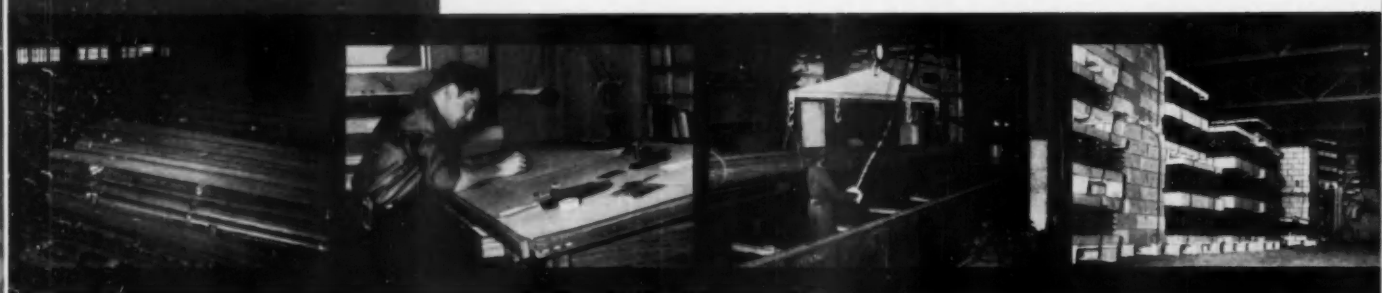
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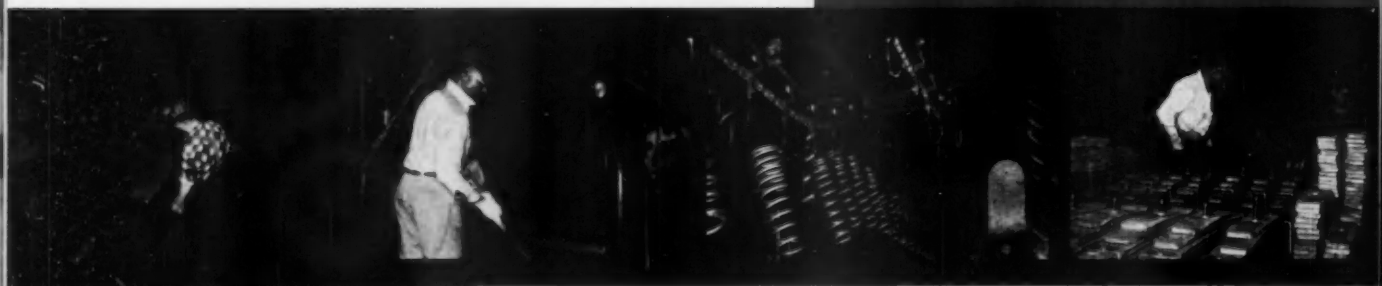
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Production Techniques

(Continued from page 106)

able mandrels in the molds to facilitate handling and proper location. The liners are grooved on the outer diameter to enhance the bond between the aluminum and iron.

After the cores and liners have been inserted, the mold is closed hydraulically. Molten metal is ladled from the holding pot and poured into the mold.

Following a brief solidification period, the mold opens and the casting is removed by an overhead hoist. It is then lowered onto a belt conveyor through an opening in the raised molding platform.

Block castings are subsequently transferred to a cooling conveyor where they cool for a two-hour period. They then proceed to finishing operations.

When cool, the block castings are vibrated to loosen and remove core sand. Then they are transferred to a special defining machine, designed and built at the Defiance plant, which automatically breaks off the sprue and removes flash from the cylinder bores, water openings, and main oil gallery. Block castings are shot-blasted in the crankcase area to remove residual core sand.

Core sand is removed from the heads on special shakeout machines.

Next, both block and head castings are placed in transfer machines, heads being milled on the manifold faces and the cover rail to remove flash and risers. Blocks are machined to remove flash from the pan rail, front face, camshaft bearing holes, and crankshaft bearings.

Castings then pass through a final cleaning operation and are heat treated. Aging for five hours at 400 F relieves stresses and stabilizes the castings.

All block and head castings are submerged in water, pressure tested with compressed air and gaged for dimensional reliability. At this point, cylinder head castings are ready for shipment to the customer's motor plant; however block castings undergo further dimensional checks.

Block castings move into a spe-

GEAR PROBLEMS?

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FAIRFIELD!

GEAR PERFORMANCE to match the ever-increasing power and speed of modern machines is a Fairfield specialty. This is possible because Fairfield has long held a position of leadership in utilizing the most advanced methods, equipment, and techniques for producing better gears **EFFICIENTLY, ECONOMICALLY**. By keeping abreast with modern engineering trends, Fairfield renders an invaluable service to many of the nation's leading machinery builders.

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Highly resistant to flex and vibrational fatigue, NYLAFLOW is available in long, continuous lengths with burst pressure ratings from 4,000 to 12,000 psi. Inside diameters range up to $\frac{3}{4}$ " and over with compact, lightweight assemblies if desired. Reusable or permanent fittings are available.

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cially designed automatic qualifying machine which locates and mills end and side targets in relationship to the cylinder bores. A final dimensional check is made on a special air-electronic gaging machine which locates on the milled targets and checks the location and surface finish of 22 separate areas, including all eight cylinder bores.

The reliability program developed for controlling all plant operations of the Central Foundry Division naturally is applied in Defiance as well. This is supplemented by an extensive research program conducted both at the Defiance laboratories and at the General Motors Technical Center. One of the significant projects now under study is in the field of application of radioisotopes to the foundry operation. This technique already has been applied in determinations of moisture in sand, in gamma-ray exploration of casting soundness, and is being studied in other directions. ■

Special Tooling at IHC

(Continued from page 78)

holder of the generating head are mounted about 7 in. apart. By moving about 3 in. transversely in its slide, the tool holder causes each tool to face about half of the flange. A wafer is then removed from the feed stop, and the same tools feed over the same surfaces for a finish cut. The entire time of the cycle, including the loading of the axle into the fixture, rough cut, finish cut, and unloading, is about 6 min. The cutting tools used are carbide throwaway inserts.

In a Milwaukee vertical miller the pads for attaching the transmission case are milled off to complete the shaft. Earlier operations are the drilling of the pads and flanges for attaching screws, and the generating of two tapered holes in each flange.

Another machining problem arose with the snapping rolls for the corn picker. These are cylindrical nodular iron castings, each having 16 irregular lugs on its outside surface. The cylinders are

(Turn to page 113, please)

WHEN YOU NEED SPECIALS If your product calls for special bearings or hardened and ground precision parts, Aetna's many years of specialization in these areas can save you money. In fact, many times, original equipment manufacturers find their problems have already been studied and resolved by Aetna's engineers and that tooling is available. For other special units, Aetna can step in at any point—from research through design, testing, or production, to help solve your specific problem. Ask your Aetna representative—listed in your classified telephone directory—for detailed information on our design and production facilities, and outline your anti-friction or parts needs for our study, consideration, and recommendations.

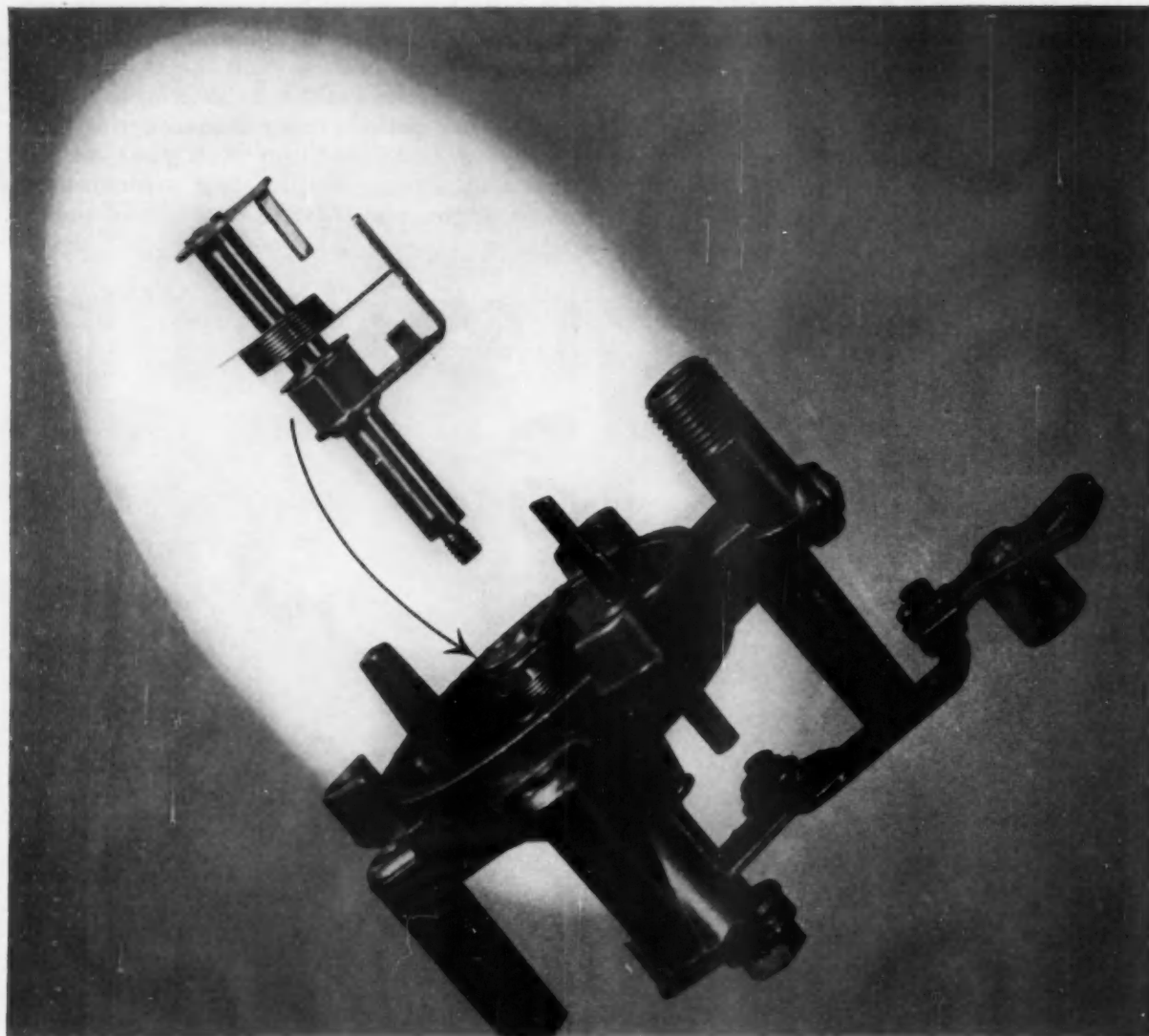


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In this carburetor choke assembly, the bearing of a Du Pont TEFLON fluorocarbon resin permits the spring to rotate with minimum friction . . . prevents carburetor sticking. The bearing is simply and economically produced by cutting a strip of TEFLON and wrapping around the bushing.

The exceptionally low coefficients of friction, both static and dynamic, offered by TEFLON resins frequently permit the use of dry bearings in places where lubrication is difficult or impossible. In addition, the virtually complete chemical inertness of TEFLON assures that bearings perform unharmed in contact with gasoline, oil, grease and

automotive chemicals. And TEFLON TFE resins are rated for continuous use from -450°F. to 500°F. Bearings of TEFLON can be tailored for increased loads and velocities or high wear resistance by the use of filled compositions and reinforced constructions.

For more information about design improvements and cost savings made possible by the use of TEFLON write to: E. I. du Pont de Nemours & Co. (Inc.), Dept. AI-715, Room 2526T, Nemours Bldg., Wilmington 98, Delaware. In Canada: Du Pont of Canada Limited, P. O. Box 660, Montreal, Quebec.



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BETTER THINGS FOR BETTER LIVING...THROUGH CHEMISTRY

Special Tooling at IHC

(Continued from page 110)

about 26 in. long by 4 in. in diameter. It is necessary to machine over the 16 lugs spaced over the surface of the cylinder so that these may run concentric with mating roll. This means making intermittent cuts in a rather hard material and, because the tools are not cutting during most of each revolution, rotation must be speeded to hold machining time to a reasonable figure.

An answer was found in a specially adapted Lehman lathe, fitted with two carriages mounted on the same ways. A tool bar is mounted on each carriage parallel to the axis of rotation of the work. Four carbide Thro-A-Way holders are mounted in the tool bar in front of the workpiece, and five are mounted on the second bar below the workpiece. The additional tool on the lower bar turns off the flange at the end of the roll. The carriages are independent of each other, but both are controlled by the machine programming.

When a roll has been lifted into the machine, the operator presses a button and the tailstock is closed on the piece by the action of a hydraulic cylinder. Pressing a second button initiates the machining cycle, beginning with the carriage holding the front tool bar.

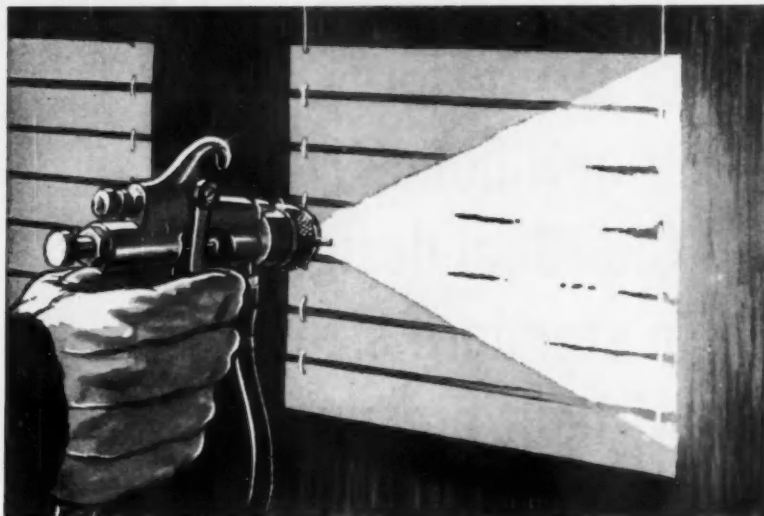
This feeds in until it reaches a positive stop that sets the depth of cut, and the carriage then feeds horizontally. After about 3 in. of travel the four cutting tools have turned eight of the lugs. The bar is then retracted automatically and the bottom bar rises to cutting position, then feeds horizontally for about 3 in. The remaining eight lugs are turned down and the end flange turned to size in one operation. Although these are interrupted cuts, cutting speed is about 525 sfpm. Motion of the cutting tools is also controlled hydraulically.

The single point tooling makes for simplicity in setup in addition to lower cutting tool costs. ■

To avoid spray booth troubles

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Oakite curtain water treatment takes the "tack" out of overspray

Just a few inexpensive ounces of the right Oakite additive in the spray booth water curtain save hours of clean-up time. The reason: Oakite chemicals surround each droplet of paint with an "anti-stick" film that keeps spray from adhering to walls, pumps, lines and water nozzles. Paint that doesn't settle or float immediately will still wash through the system—but it won't stick, won't clog the sprays. The result: a water curtain without gaps, a smooth running system, *no* unplanned downtime.

There's a full line of Oakite water additives... one to match any of the countless paints, enamels and organic coatings. The *right* one will help paint sink to the sump... or float to the surface for skimming off... or overcome special hard water troubles... or combat foaming problems. What's *your* problem? Ask the Oakite man to make free tests in your paint spray booth. They won't interfere with production. They may save you hours of spray booth downtime. Bulletin F-9443 tells more. Write Oakite Products, Inc., 28A Rector St., New York 6, N. Y.

it PAYS to ask Oakite





DESIGN NOTES

C/R offers new bonded CRS Seal design in standard sizes — without premium tooling charges



Design Advantages

The CRS Seal now provides a new level of C/R Seal performance through its simple, bonded design. There are no internal parts to misalign, no avenues for internal leakage. The shell and sealing member are integral — bonded securely for the long life of the seal. The CRS Seal incorporates a sealing member with both improved lip configuration and improved concentricity. The sealing member has been strengthened over former designs by placing more material at points of major flex and wear — and without increased shaft loading.

Designer Advantages

The CRS Seal gives the designer one, basic, rugged shaft seal design which may be applied with high reliability to the great majority of common shaft seal applications — particularly in industrial, automotive, farm, and off-the-road equipment.

Four basic design variations are available. As you can see, these provide an auxiliary sealing lip, where it may be required, or provide extra rugged shell construction where conditions suggest the need to protect the seal lip against assembly damage — or where large, heavy-duty shafts are being sealed.

Selection of the new C/R Type CRS Seal gives the designer and buyer major advantages over special seals: shorter lead time on orders, simpler specification, savings in time and money, and improved assembly quality and reliability.

Operating Maximums*

Shaft Speeds	3600 fpm (single lip) 2500 fpm (double lip)
Run-out	.015" TIR dynamic eccentricity .010" static eccentricity
Temperature	-30 to +275°F. (225°F. in EP lube)
Pressure	5 psi (single lip) 10 psi (double lip)
Media	Oil, grease, fuel, water

*Not all conditions present in one application

New, Improved Compound

Standard sealing members for the C/R Type CRS Seal are molded of a new Sirvane synthetic rubber compound having markedly superior sealing and wearing properties. It is a Buna-N-based material with low-friction characteristics. The CRS Seal can also be furnished in the usual special materials such as acrylates, Sili-

cones, and butyls. Shells are of standard steel, but can be provided in corrosion-resistant materials on special order.

Consult C/R Engineers

For assistance on the application of the new CRS — or on any oil seal problem, get in touch with C/R Oil Seal Engineers. They're specialists in fluid sealing — and will gladly cooperate with you.

For More Design Data:

You will want the complete design data on the new CRS Seal. Write for our Bulletin CRS-100. It gives you the complete list of standard sizes, widths, O.D.'s, shell thicknesses and sealing lip heights. You will want it to compare and then specify C/R's CRS Seal.

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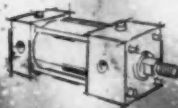
drive applications. The Spacemaker is available in a complete range of bore sizes and strokes, air or hydraulic, and contains many *plus features* and extras as STANDARD . . . NO EXTRA COST! Write Tomkins-Johnson, 2425 W. Michigan Ave., Jackson, Mich. for Bulletin #155-4 and for full particulars, today.



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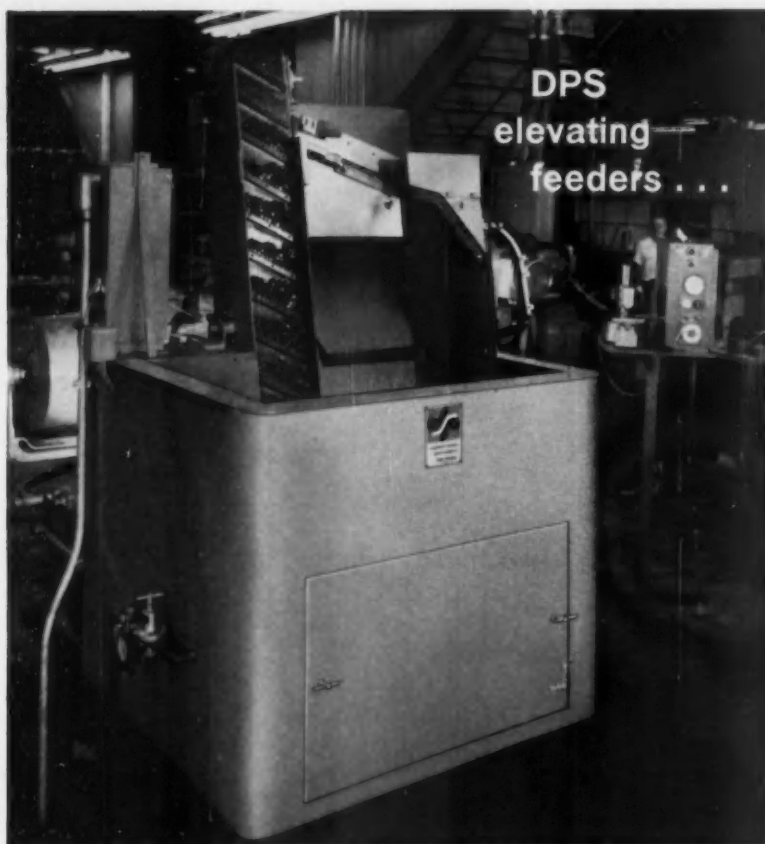


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This 6-cu. ft. DPS elevating feeder handles 36 different sizes of rollers for spherical roller bearings. Rollers are elevated to feed track, where they are oriented, and sent along track to grinder in a continuous flow.

store and orient parts . . . feed at high speed

Today, many processing and assembly machines are not producing at rated capacity because of inadequate feeding arrangements. Hand feeding methods are often unable to match rated capacity of modern equipment . . . production suffers.

DPS elevating feeders are helping industry meet their feeding requirements. They orient and feed parts gently, and in a continuous flow to match production rates . . . handle parts of almost any material (metal, plastic, felt, rubber, etc.) and of practically any shape. Versatile in design, the elevating mechanism can be engineered to discharge parts to either side of feeder and at desired height. Feeders with 3, 6, 12 or 20 cubic foot storage hoppers are available.

Your DPS engineer is in a unique position to recommend the one best feeder from its line of rotary, vibratory and elevating types . . . the most complete in industry. Write or call today. Ask for elevating feeder folder 2812.



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MORE GOVERNMENT CONTRACT AWARDS

LATEST contracts awarded by various Government agencies, and covering primarily automotive and aviation products, are listed in the following. Typical of the items contained in these monthly listings are: passenger cars, motor trucks, aircraft, military tanks, engines, transmissions, other components, spare parts, plant equipment, etc. This list is for the period June 2 to July 3 inclusive.

AMERICAN MOTORS CORP., Detroit, Mich.

Sedans, 22 ea.—\$29,056

ARMSTRONG RUBBER CO., West Haven, Conn.

Tires, 7,500 ea.—\$134,250

AUTOMATIC TRANSPORTATION CO., DIV. YALE & TOWNE MFG. CO., Chicago, Ill.

Truck, lift fork, 4 ea.—\$46,780

BAKER INDUSTRIAL TRUCKS, DIV. OF OTIS ELEVATOR CO., Cleveland, Ohio

Truck, fork lift, 751 ea.—\$3,302,355

BRYANT CHUCKING GRINDER CO., Springfield, Vt.

Raceway Grinder—24 ea.—\$838,080

CHRYSLER MOTORS CORP., Washington, D. C.

Ambulances and Trucks, 37 ea.—\$140,196

CHRYSLER MOTORS CORP., Washington, D. C.

Trucks, 31 ea.—\$120,464

FORD DIV., FORD MOTOR CO., Washington, D. C.

Sedans & Station Wagons, 66 ea.—\$122,576

FORD DIV., FORD MOTOR CO., Washington, D. C.

Trucks, various, 67 ea.—\$152,535

FORD MOTOR CO., GOV. SALES DEPT., Washington, D. C.

Trucks & Station Wagons, 31 ea.—\$99,327

GENERAL MOTORS CORP., CHEV. MOTOR DIV., Detroit, Mich.

Passenger vehicles, 16 ea.—\$26,184

GENERAL MOTORS CORP., CHEV. MOTOR DIV., Detroit, Mich.

Trucks, various, 142 ea.—\$350,125

GENERAL MOTORS CORP., FOREIGN DIST. DIV., Detroit, Mich.

Sedans & spare parts, 9 ea.—\$15,392

GENERAL MOTORS CORP., FOREIGN OPERATIONS DIV., Detroit, Mich.

Trucks, 11 ea.—\$20,695

GENERAL MOTORS CORP., FOREIGN DIST. DIV., Detroit, Mich.

Ambulances, 6 ea.—\$15,783

GENERAL MOTORS CORP., FOREIGN DIST. DIV., New York, N. Y.

Sedans & Station Wagons, 20 ea.—\$31,116

GENERAL MOTORS CORP., FOREIGN DIST. DIV., New York, N. Y.

Trucks, various, 52 ea.—\$98,977

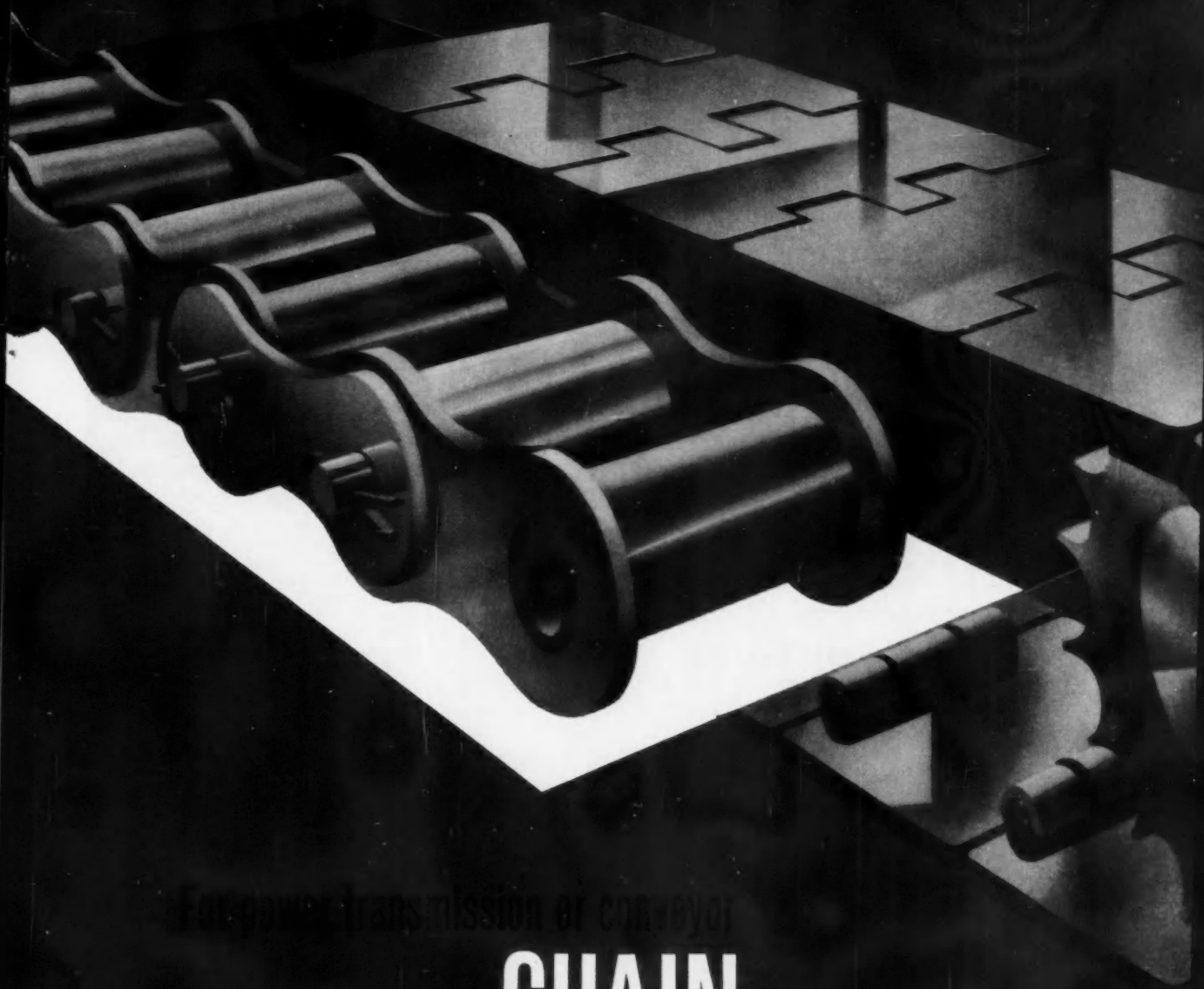
GENERAL MOTORS CORP., GMC TRUCK & COACH DIV., Pontiac, Mich.

Trucks & buses, 7 ea.—\$37,638

GENERAL TIRE & RUBBER CO., Akron, Ohio

Tires, various—\$814,868

(Turn to page 118, please)



CHAIN

Superior STAINLESS

foils corrosion—lengthens life

The Superior Stainless combination of higher strength for heavier loads, abrasion resistance for longer wear, and corrosion resistance for maximum service life and cleaning ease is well illustrated in these applications by Atlas Chain & Manufacturing Co. Plus values to the maker are Superior's uniform fabricating ease and dependability—prompt deliveries—close cooperation at all times. Why not enjoy these benefits for *your* stainless strip applications? Call us!



SUPERIOR STEEL DIVISION

OF
COPPERWELD STEEL COMPANY
CARNEGIE, PENNSYLVANIA

For Export: Copperweld Steel International Company, New York



CONTRACT AWARDS

(Continued from page 116)

B. F. GOODRICH AVIATION PRODUCTS, Akron, Ohio
Aircraft tires, 3,768 ea.—\$115,473

GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Tires, various—\$1,045,402

HARRINGTON-WILSON-DAUM CORP., Mt. Vernon, N. Y.
Lathe, engine, heavy duty—\$57,723

FRANK G. HOUGH, Libertyville, Ill.
Tractor, aircraft towing, 12 ea.—\$174,660

HYSTER CO., Portland, Oreg.
Truck, fork lift, 130 ea.—\$1,124,936

INTERNATIONAL HARVESTER CO., Washington, D. C.
Trucks, various, 100 ea.—\$465,762

INTERNATIONAL HARVESTER, Chicago, Ill.
Tractors, 34 ea.—\$58,045

INTERNATIONAL HARVESTER CO., CONSTRUCTION EQUIP. DIV., Melrose Park, Ill.
Tractor, crawler type, 1 ea.—\$12,007

KEARNEY & TRECKER CORP., Milwaukee, Wis.
Milling machine, 2 ea.—\$62,556

LELAND-GIFFORD CO., Worcester, Mass.
Drilling machine, 1 ea.—\$45,055

R. K. LEBLOND MACHINE TOOL CO., Cincinnati, Ohio
Lathe, engine, 6 ea.—\$76,235

LOMBARD CORP., Youngstown, Ohio
Press, straightening—\$74,494

McILVANE MACHINE WORKS, Yakima, Wash.
Lathe, engine, 9 ea.—\$91,800

MONARCH MACHINE & TOOL CO., Cleveland, Ohio
Lathe, engine—\$32,639

PETTIBONE MULIKEN CORP., PETTIBONE MERCURY DIV., Washington, D. C.
Truck, lift, 15 ea.—\$100,062

PRATT & WHITNEY CO., INC., West Hartford, Conn.
Machine, milling—\$39,320

REO MOTOR TRUCK DIV., WHITE MOTOR CO., Lansing, Mich.
Trucks, 2 ea.—\$21,493

ROBBINS TIRE & RUBBER CO., Tusculumbia, Ala.
Tube, inner, 33,500 ea.—\$130,985

RUDEL MACHINERY CO., New York, N. Y.
Lathe, vertical turret—\$160,700

SIM GRADY MACHINERY CO., Savannah, Ga.
Tractors, crawler, 2 ea.—\$66,048

TOWMOTOR CORP., Cleveland, Ohio
Truck, fork lift, 59 ea.—\$252,665

UNITED STATES RUBBER CO., Detroit, Mich.
Aircraft tires & tubes, 1,010 ea.—\$64,768

GEORGE E. VIERECK & CO., INC., Washington, D. C.
Drilling machine, 1 ea.—\$82,309

WHITE MOTOR CO., Lansing, Mich.
Military trucks, 3,976 ea.—\$22,466,791

WHITE MOTOR CO., LANSING DIV., Lansing, Mich.
Trucks—\$22,466,791

WILLYS MOTORS, INC., Toledo, Ohio
Ambulances & trucks, 119 ea.—\$306,124

HANSEN

SERIES HK® QUICK-CONNECTIVE TWO-WAY SHUT-OFF COUPLINGS

QUICK FLUID LINE CONNECTION
OR DISCONNECTION

WITH
INSTANT AUTOMATIC FLOW
OR SHUT-OFF

*Instantly shuts off both sides
of line... prevents loss of
liquid, gas or pressure*

When Coupling is disconnected, identical valves in both the Socket and Plug provide instant shut-off of gas or liquid. To eliminate leakage or spillage during disconnection, the Coupling is so designed that shut-off takes place *before* the Plug separates from the Socket—and *before* the seal of the Socket itself, provided by the Socket "O" Ring, is broken.

In reverse, when Coupling is connected, the "O" Ring in the Socket completely seals Coupling *before* valves release flow of fluid from both sides of line—thus eliminating possibility of spurt of gas or liquid during instant of connection.

Available in brass or steel with female pipe thread connections from 1/8" to 1 1/2" inclusive—also up to 1" in stainless steel.



Write for the Hansen Catalog

Here is an always ready reference when you want information on couplings in a hurry. Lists complete range of sizes and types of Hansen One-Way Shut-Off, Two-Way Shut-Off, and Straight-Through Couplings—including Special Service Couplings for LP-Gas, Steam, Oxygen, Acetylene, etc.



Representatives in Principal Cities
... see Yellow Pages

SINCE 1915



QUICK-CONNECTIVE FLUID LINE COUPLINGS

THE HANSEN

MANUFACTURING COMPANY

4031 WEST 150th STREET • CLEVELAND 35, OHIO

BOOKS...

MANAGEMENT GUIDE FOR MAINTENANCE COST REDUCTION, by Bernard T. Lewis and William W. Pearson, published by John F. Rider Publisher, Inc., 116 W. 14th St., New York City. Price, \$1.50. This portion of the series is ideal for industrial training programs; as a reference text for industrial management consultants, and as a teaching text for colleges teaching business administration or industrial engineering.

MANAGEMENT GUIDE FOR WORK SIMPLIFICATION, by Bernard T. Lewis and William W. Pearson, published by John F. Rider Publisher, Inc., 116 W. 14th St., New York City. Price, \$1.50. This guide suggests practical means and techniques for the evaluation and analysis of time waste procedures and what can be done to eliminate waste.

HIGH-STRENGTH STEELS FOR THE MISSILE INDUSTRY, by H. T. Sumstun, published by American Society for Metals, Metals Park, O. Price, \$12. Problems in development and application of ultra-high-strength metals for the missile program are stressed in this technical book for the materials and process engineer.

ANALYSIS FOR PRODUCTION MANAGEMENT, by Edward H. Bowman and Robert B. Fetter, published by Richard D. Irwin, Inc., Homewood, Ill. Price, \$11.55. This new and unique approach is oriented around the methods of analysis that may be used to solve economic problems of production management.

A world of precision plastics... from Plastene

More and more automobile manufacturers are turning to molded plastics because of their versatility, utility and low cost. Typical of Plastene's unique and varied contributions to the automotive field is one of its recent developments—an in-line nylon gasoline filter bowl body. Plastene not only designed this rugged unit but performed the intensive evaluation and testing required to assure optimum performance and long life.

What does Plastene's rigid emphasis on precision mean? It means that Plastene draws on its outstanding engineering and fabrication skills to control every step of the manufacturing process. Which, in turn, means that every item from the beginning to the end of each production run is turned out to Plastene's uncompromising quality standards.

Plastene's unusual skills and abilities, its three strategically located plants in Crawfordsville, Ind., Norwich, Conn., and Anaheim, Calif., are available to you. Plastene offers you a world of polystyrene, polyethylene, acrylic, polypropylene, acetate, delrin and nylon automotive products—made to Plastene precision standards. Write today for complete information.

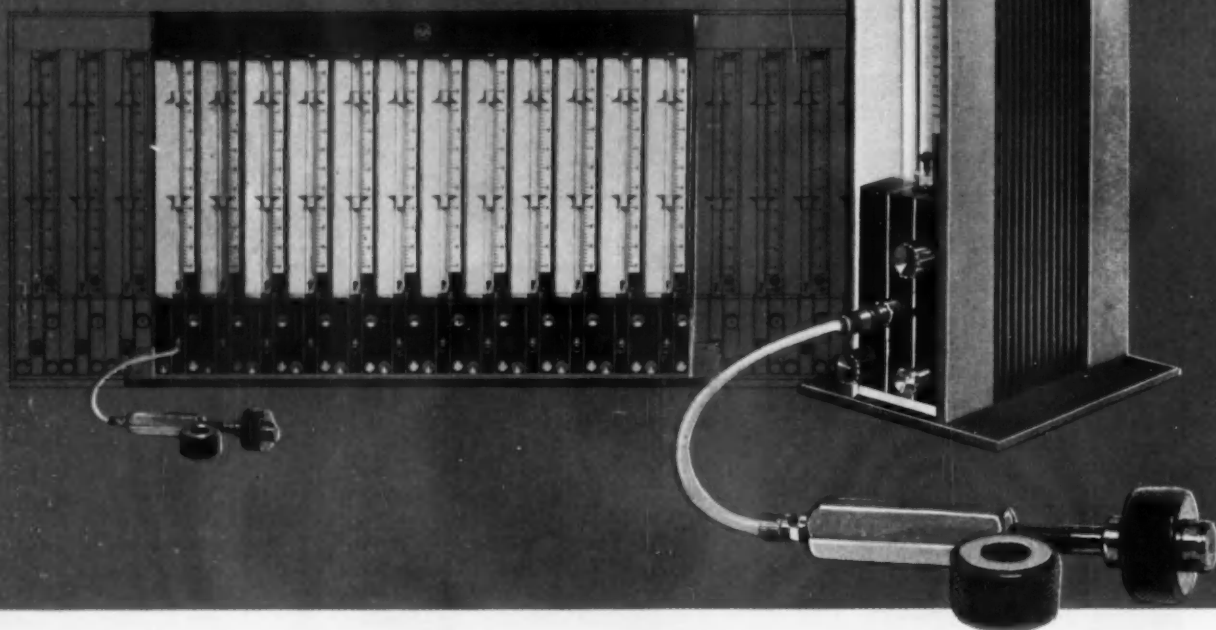


PLASTENE

Plastene Corporation, Crawfordsville, Indiana • Subsidiary of The American Thermos Products Company

NEW...from RCA

The best designed AIR GAGE ever offered!



COMPARE THESE OUTSTANDING FEATURES!

- Four ranges of adjustable magnification are provided with 10" linear scale.
- Tube is spring-loaded with positive seal to provide for simple change and removal.
- Captive float cannot drop out when tube is removed.
- Four spare tubes and scales can be stored internally in the column.
- Modular design permits flexibility in grouping units with minimum space.
- Complete range of tooling is available for gage use.

No other air gage on the market can match the ease and compactness with which these RCA units can be grouped into multiple systems . . . expanded at will at minimum cost. Their attractive functional design with this built-in expansion feature is certain to be a welcome innovation to all users of such equipment.

RCA offers these Air Gages as single or multiple units for bench-type operation or as components of automatic systems. A complete range of tooling is also available for all types of measurements normally performed with this equipment.

RCA also manufactures Industrial Computers and Controls, and a complete line of Electronic Gaging Systems, Grinder Controls, Automatic and Bench-type Hardness Testers, Parts Feeding and Assembly Systems and Electronic Comparators. Whatever your automation requirements, RCA offers the most versatile range of equipment available.

*Before you buy Air Gaging,
Check RCA. Write to RCA,
Industrial Controls, Dept.
XC-432, 12605 Arnold Avenue,
Detroit, Mich., or see
your PCA Representative.*

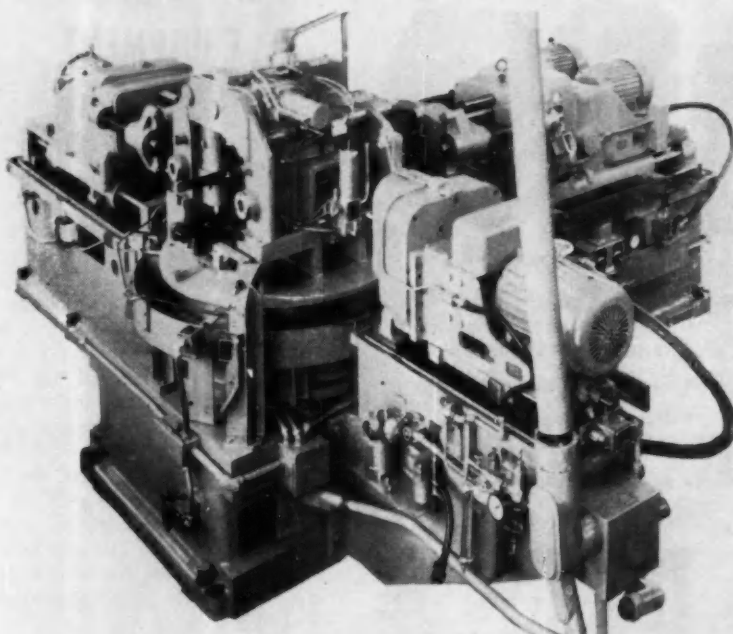


The Most Trusted Name in Electronics
RADIO CORPORATION OF AMERICA

Circle 170 on Inquiry Card for more data

Multiple Spindle Drilling and Tapping Machine

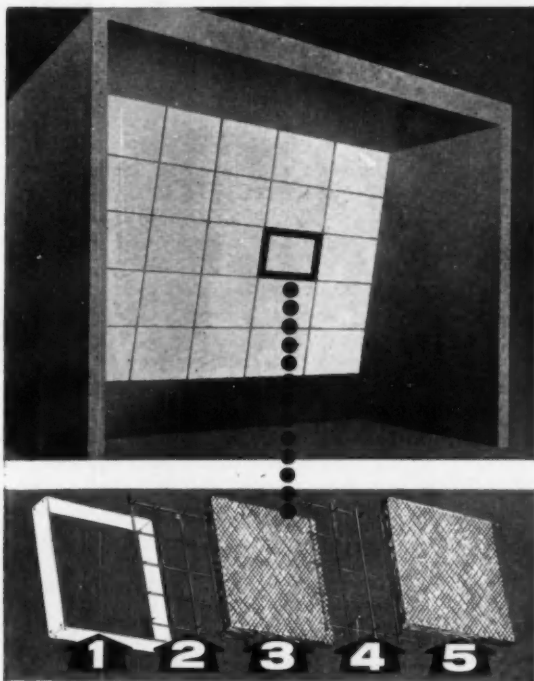
(Continued from page 85)



Multiple-way machines of this type can be custom-fabricated with vertical or angular heads, as well as horizontal ones
Circle 91 on Inquiry Card for more data

A NEW 3-way, 11 spindle hydraulic feed machine for drilling and tapping cylinder blocks and other large components has been introduced. The three horizontal way-units center on a four position power indexing table which carries the work fixture. After loading, the fixture table indexes, locating the part for each way-unit in turn.

In operation, the part slides into the indexing fixture, which clamps and locates the part automatically. The fixture indexes 90 deg clockwise, and locks to permit the left-hand head to rough bore and chamfer one 3.8 in. hole, simultaneously drilling and chamfering four $\frac{3}{8}$ in. holes. After the part indexes another 90 deg, the back way-unit finish bores the 3.8 in. hole, and drills one 0.438 in. hole. A third index of 90 deg brings the part to the right-hand way-unit, which taps the four $\frac{3}{8}$ in. holes. A fourth index completes the rotation, and the part is released for unloading. Total cycle time is 1.77 minutes, equivalent to a production rate of 27 parts per hour at 80 pct. The Foote-Burt Co.



A Paint Arrestor module consists of a Holding Frame (1), two Snap-in Grids (2 and 4), two Paint Arrestors (3 and 5). Loaded Paint Arrestors are simply replaced as necessary. And, they're also ideal for air-borne ink, mist, dye, frit, etc.

CONTROL PAINT OVERSPRAY the inexpensive, effective way!

The advantages of R P Paint Arrestors, the inexpensive, disposable air filters are many. Overspray solids are trapped before they reach the exhaust stack... to reduce fire hazards, damage to adjacent property... disagreeable and time-consuming maintenance work. Installation? —easy and fast. Maintenance? —remove loaded Paint Arrestor and replace a new one. Adaptability? —ideal for any type, any size booth, new or existing.

RP PAINT ARRESTORS



Products of Research



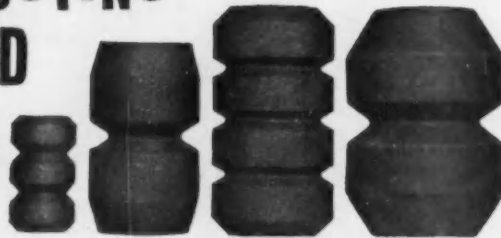
RESEARCH PRODUCTS Corporation

Dept. 310-G, MADISON 1, WISCONSIN



NEW SELF-ADJUSTING OVERLOAD SPRING

FOR ALL TYPES
OF VEHICLES!



Amazing **MOOG Hollow Rubber Helper Spring** adjusts automatically to changing loads! Now you can get the extra riding comfort and load stability of a true *progressive-rate spring* at less than the cost of ordinary overloads.

The **MOOG Hollow Rubber Helper Spring** is not a gadget, air-bag or a spacer, but a completely new overload concept... thoroughly tested, proven in use and backed up by over 40 years of **MOOG** spring-suspension leadership.

Standard sizes fit passenger cars and light trucks, but special units fit everything from golf carts to heavy earthmoving equipment.

Write today describing your vehicle or send for **FREE** booklet explaining in detail the 11 advantages of the **MOOG Hollow Rubber Spring**.

MOOG INDUSTRIES, INC., 6565 Wells Avenue, St. Louis 33, Mo.
SPECIALISTS IN AUTOMOTIVE SUSPENSION SINCE 1919

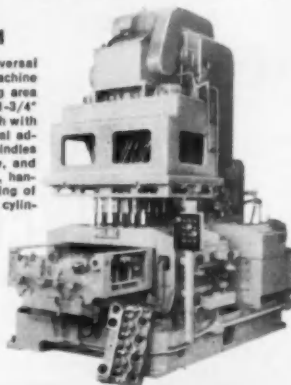
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- Made of natural live rubber
- Remarkably long life
- Doesn't affect normal ride or raise rear-end when unloaded
- Prevents bottoming, swaying
- Needs no lubrication
- Rides quiet
- Quickly installed



MODEL HU111

Hydraulic Feed, Universal Joint-Type Drilling Machine with 24" x 50" drilling area and with forty-two 1-3/4" spindle drivers, each with two-speed and neutral adjustment. Thirty-six spindles in slip spindle plate, and power shifting fixture, handle drilling and reaming of three different engine cylinder heads.



HD13

Straight line drilling machine with hydraulic table feed and 18 spindles each having 11/16" diameter drill capacity in mild steel. Spindle center distances are adjustable along the 6-foot machine rail.

MOLINE Cost Reducing Equipment

MODEL MR148

Three-way, three-spindle, horizontal boring machine with selective automatic feed cycle. Handles boring of cylinder and crank bore for 3 sizes of 1-cylinder blocks. Also bores for wet sleeves in 2- and 3-cylinder blocks.

60 years of Machine Tool Engineering
Experience is at your service for

- Multi-Spindle Boring • Single and Multi-Spindle Honing
- Straight Line Multi-Drilling • Adjustable Spindle Drilling
- Special Multiple Operation Machine Tools

Write for Details

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100 20TH STREET • MOLINE, ILLINOIS

REPRESENTATIVES
IN PRINCIPAL CITIES



116

NEW PRODUCTION and PLANT EQUIPMENT

(Continued from page 87)

Car-Bottom Kiln

A **CAR-BOTTOM** electrically heated, periodic kiln is designed for diversified applications such as the development and production of ferrites and other electrical ceramics, refractories, grinding wheels, porcelain and others. Operation of the kiln is fully automatic, and the preset cycle can be changed or altered at any time, either in the firing or in the cooling—after the cycle has started. Rigid uniformity of temperature is maintained automatically. Also, the rate of temperature rise, as well as the quench cycle, can be varied at any time. The design of the kiln permits effective utilization of closely controlled protective atmospheres. The unit has a working chamber 21" wide, 60" long and 36" high, and its efficiency allows a gross load of 1600 pounds to be cooled from 2500 deg. F to approximately 200 deg. F in 8 hours. Kiln Div., Lindberg Engineering Co.

Circle 92 on Inquiry Card for more data

Precision Tool Holder

CALLED the Universal Lathe-Tool Holder, this device does not require resetting of the holder to grind the second side of the tool. Just set the turret, which can be rotated 360 deg. at the desired tool angle, insert and tighten the tool. Grind one side of the tool and flip the tool holder onto the other side to grind the other side of the tool. All kinds of lathe tools—turning, chamfer, grooving, forming; internal, external, offset, right or left hand—can be ground in the same manner. This holder is designed in triangular form with an included angle of 60 deg. Each side of the angle is compounded with a 5-deg. clearance angle. Graduations on the tool holder are in 5-deg. increments to 45 deg. with special indications at 14½ deg. to guarantee perfect settings for Acme threads. The Tool Holder adapts easily to height gage use for accuracy as required. A steel, electroless nickel-plated turret accommodates carbide tipped as well as high speed tools up to 1 in. depending upon the model used. Models 200, 500, 625, 750, and 1000 are available with capacities of ⅜, ½, ⅝, ¾, and 1 in. respectively. *Dern Tool Co.*

Circle 93 on Inquiry Card for more data

a fel-pro gasket
progress report

WINS OEM

approval!

Now adopted for one or more applications by leading car factories and manufacturers of trucks, diesel engines, farm tractors, etc.

REASONS: EXCEPTIONAL DIMENSIONAL STABILITY, CONFORMABILITY, SEALING ABILITY, GREATER RESISTANCE TO HIGH PRESSURES AND TEMPERATURES, AND MANY OTHERS.

new FEL-CoPRENE

the new rubber gasket for cylinder head covers, crankcase and automatic transmission oil pans, etc.

Fel-CoPrene is being used increasingly for O.E.M. Proving ground and laboratory tests, backed by several years of astonishing results on millions of cars, prove beyond doubt Fel-CoPrene is a most superior sealing material. It solves leakage problems, eliminates costly returns and is unaffected by oils and mild solvents.

Fel-CoPrene is an exclusive rubber formula developed by Fel-Pro in cooperation with leading car factories. Its exceptional dimensional stability eliminates those annoying problems of fit. Even after months of storage, Fel-CoPrene does not break . . . become brittle . . . lose resiliency . . . or change its size. It will not stick or tear even after prolonged high-temperature operation—comes off cleanly in one piece.

For complete details, specific performance statistics and cost data write FELT PRODUCTS MFG. CO., Skokie, Illinois. In Detroit: 19932 Livernois Ave. Phone: UNiversity 2-3522.

FEL-PRO gaskets



gasket specialists

since 1918

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AUTOMOTIVE INDUSTRIES, July 15, 1961

Circle 174 on Inquiry Card for more data

123

VICTOR

TYPE
K4



Victoprene on O.D. and outer face; patented lead-into-bore feature. Integrally molded element and case.

TYPE
K6



Steel O.D.—Victoprene gasket on inside face. Primary lip retains lubricant; secondary lip excludes dirt, foreign matter.

PROVEN DESIGN

compact, dual-lip
oil seals
as narrow as ¼-inch

Victor Victoprene oil seals in two types to accommodate varying installation and bore sealing needs, yet provide identical shaft sealing efficiency in even the most limited housing space.

- **DUAL SEALING SURFACES**—Inner lip retains fluid; outer lip excludes foreign matter or confines secondary lubricant.
- **VICTOPRENE ELEMENT**—Developed of improved Buna N synthetic rubber for balanced resistance to lubricants, heat, age deterioration.
- **PERMANENT PRE-LUBRICATION**—Cavity between lips holds lubrication on installation. Reduces frictional drag; extends seal life.
- **NARROW WIDTH**—One-piece integral molded construction for most compact seal housing.
- **POSITIVE SPRING LOCATION**—Molded groove retains spring; uniform pressure on shaft assured. Both types available without spring.
- **POSITIVE BORE SEALING**—Type K4 has bonded-to-case Victoprene on O.D. and outer face; lead-in allows easy installation. K6 has steel O.D. with integral gasket on inside face for bottom of bore seal.

WRITE FOR CATALOG...

Covers above types and all varieties of Victor oil seals; includes service recommendations. Useful to specifiers and buyers. Victor Mfg. & Gasket Co., P.O. Box 1333, Chicago 90, Ill. Canadian plant: St. Thomas, Ontario.



VICTOR

Sealing Products Exclusively

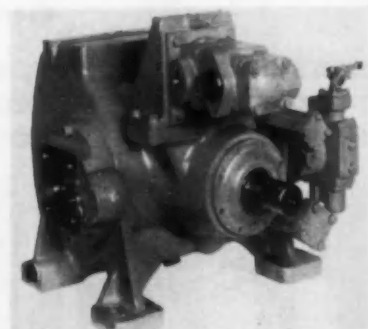
OIL SEALS • GASKETS • PACKINGS
MECHANICAL SEALS

Circle 175 on Inquiry Card for more data

Pumps and Motors

ANGLE type piston pumps and motors rated for pressures to 5000 psi have been introduced in a new line. The first of the new line is shown in the illustration. A wide variety of controls, high pressure capability, instant response to control signals, and reversible flow make the units usable in any application requiring high pressure and flows.

New Vickers series 120 units are available as either pumps or motors, with fixed or variable displacement. The new-design pumps operate at 1200 rpm with atmospheric intake and at 1800 rpm with supercharging,



permitting use of standard electric drive motors. Pump delivery at these speeds is 120 gpm and 180 gpm, respectively. Maximum pressure rating of 5000 psi permits use of more compact components and assures reliability at normally-encountered pressures. Maximum displacement is 23.7 cu-in. per revolution, and maximum torque is 378 lb-in. per 100 psi.

With servo control, the variable displacement pump can be stroked from maximum displacement in one direction to full opposite in about ½ second, enabling output flow to follow controlling signal precisely. The variable package with control and an auxiliary pump has a horsepower-to-weight ratio of about 3.2 lb per hp, based on 1200 rpm and 5000 psi. Vickers, Inc.

Circle 94 on Inquiry Card for more data

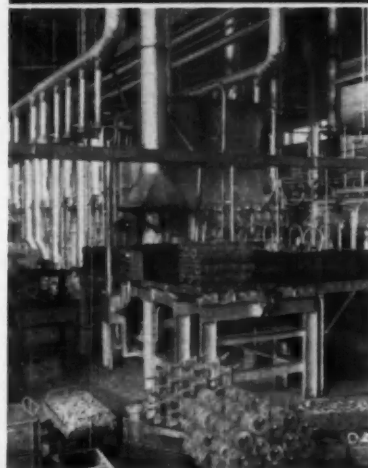
Weld Grinding Wheel

CUP-N-SAUCER is the name given a new reinforced grinding wheel for use in weld grinding and light snagging operations. The wheel incorporates the advantages of a saucer shaped wheel with the convenience of a throw-away mount.

The wheels are available in 7 and 9 in. sizes to fit standard threaded spindles on portable grinding equipment. Norton Co.

Circle 95 on Inquiry Card for more data

HOLCROFT



Production Heat Treating Equipment

Working with these materials:

- ✓ ALUMINUM
- ✓ BRASS
- ✓ COPPER
- ✓ STEEL
- ✓ MALLEABLE
- ✓ STAINLESS
- ✓ CAST IRON



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44 YEARS OF ENGINEERING LEADERSHIP

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Circle 177 on Inquiry Card for more data →

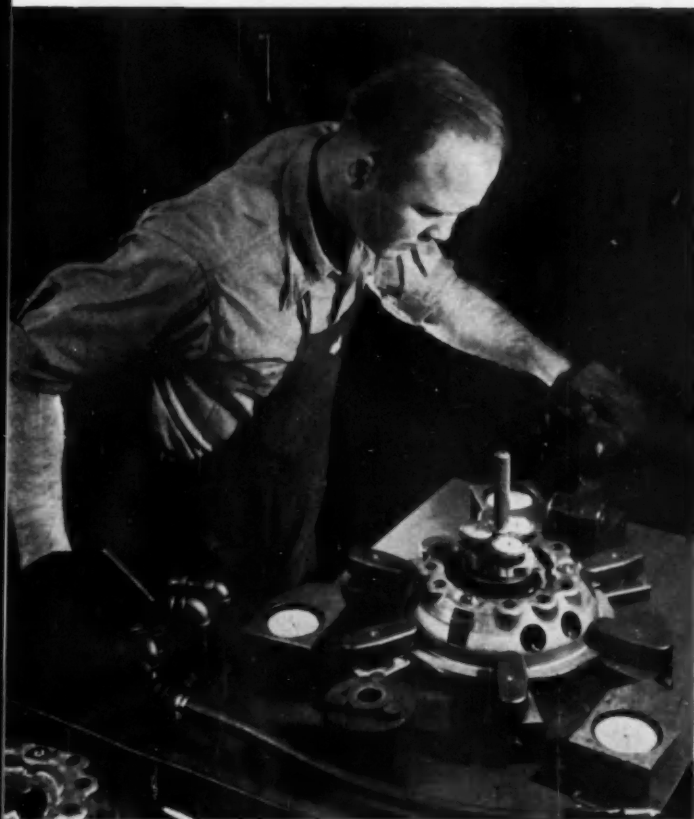
Quality Control is a **BORG & BECK** tradition that means

BETTER CLUTCHES

At Borg & Beck, quality control is not just a phrase to which we pay lip service. It is a tradition born of the long-standing Borg & Beck policy of building up to a standard—not down to a price.

In the photograph at the left, for example, release levers are being checked on special equipment to make sure they are parallel with the pressure plate. As shown at the right, every Borg & Beck clutch plate is carefully tested for correct deflection to assure positive release. And every driven plate and cover assembly is dynamically balanced for maximum smoothness of operation.

These exacting tests are typical of the extra care that goes into every step in the making of Borg & Beck clutches. They are your assurance of top quality, top performance, top value. And that means: **BETTER CLUTCHES.**



BORG-WARNER

BORG & BECK®

THE AUTOMOTIVE STANDARD FOR MORE THAN 40 YEARS

BORG & BECK DIVISION, BORG-WARNER CORPORATION, CHICAGO 38, ILLINOIS

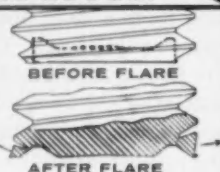
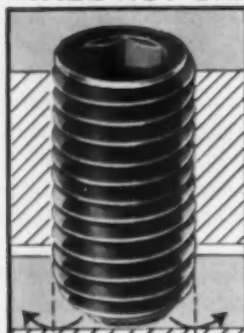
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new setko

FLARE-LOK

SET SCREW

WILL NOT SHAKE LOOSE!



- STOPS NEEDLESS SERVICE PROBLEMS
- CUTS REPLACEMENT COSTS
- INCREASES OPERATING EFFICIENCY
- IDEAL FOR POWER TOOLS, MACHINERY, ETC. WHEREVER VIBRATING CONDITIONS EXIST.

HERE'S HOW IT WORKS: The point of the FLARE-LOK set screw is specially formed to flare out when it is tightened against a bearing surface. The thread gap is closed just enough to prevent loosening or shaking free due to vibration, etc. Yet, the screw may be removed without damaging the mating threads. You can get them in hex socket, slotted or slotted heads.



WRITE FOR FREE "FLARE-LOK" TEST SAMPLES and full information TODAY.

Set Screw & Mfg. Co.

16 Main Street, Bartlett, Illinois

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molded in
one-piece..

2 durometers



Drain Manifold
60 and 80 Durometer

Dual durometer process lets you combine hard-soft sections in

one piece... with one-operation economy. Ask to see samples!

eliminates fabricating costs!

improves quality!

increases design flexibility!

GEAUGA INDUSTRIES CO.

A Subsidiary of Carlisle Corporation
MIDDLEFIELD, OHIO



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IF EXTRA CAPACITY IS YOUR FUEL TANK PROBLEM



LET OUR QUALIFIED SALES
ENGINEERS HELP YOU...

ALWAYS SPECIFY SNYDER

SNYDER TANK CORP.

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FITZGERALD

Fused-Aluminum
Steel and Asbestos

GASKETS

and costly
gasket failures

Specially designed,
ruggedly built, to
give a lasting,
perfect seal in high
compression engines,
gasoline or diesel.

There's a Fitzgerald
Gasket for Every Engine

Grease Retainers

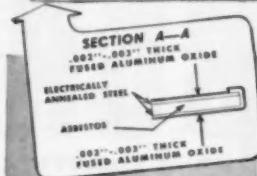
Cork Gaskets

FITZ-Rite Treated Fiber
Gaskets for oil, gasoline
and water connections



THE FITZGERALD MANUFACTURING CO.

Torrington, Connecticut



FITZGERALD
gaskets
SINCE 1906

Circle 181 on Inquiry Card for more data

**Blood Brothers
Drive Assemblies help give
power "pay-off" in**

TOUGH HOUGH PAYLOADER®

Many outstanding improvements have made this Hough Model H-90B Tractor Loader a proven leader in its field. Available with 1½, 3 and 5 cubic yard capacities, it offers a full 50° bucket-dumping angle, plus maximum lifting height and reach for loading large hauling units.

The lower-front drive shaft and lower-rear drive shaft used on this latest equipment were manufactured to exacting specifications by Blood Brothers. It is typical of the many quality drive assemblies Blood Brothers furnish for special equipment of all sizes.

Rockwell-Standard's Universal Joint Division offers a wide range of specialized engineering experience — involving everything from manual steering assemblies . . . to power take-off drives . . . to heavy-duty propeller shafts.

If you are planning or designing new equipment, consult our engineers for important savings in time and money. A letter or phone call will bring cooperative, friendly, experienced assistance.

Write for complete information



Another Product of

ROCKWELL-STANDARD
CORPORATION



Universal Joint Division, Allegan, Michigan

in a compact pick-up



or an earthmover



in any size vehicle

PUT THIS
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**DETROIT AUTOMOTIVE
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NoSPIN Differentials and Super **LOAD-BOOSTER** third axles

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DETROIT, 13, MICHIGAN, U. S. A.

Circle 183 on Inquiry Card for more data



ON OUR
WASHINGTON WIRE

(Continued from page 86)

Industry faces what amounts to new "administered price" hearings. New hearings will follow the Senate Antitrust subcommittee's quiet investigation of the relation of "administered price" in U. S. industries to this country's deteriorating position in world markets. The auto, steel and machinery industries will be at the top of the witness list. The hearings will be held during the next session of Congress.

The Administration's plan to elevate the Housing and Home Finance Agency to Cabinet status is getting close Congressional scrutiny. So far, Congress is not prone to create a Department of Urban Affairs and Housing. The new department would coordinate all government housing programs, including Federal financing programs.

CLASSIFIED ADVERTISEMENT

SALESMEN WANTED — AUTOMOTIVE MEN — Continuous earnings, year after year, taking orders for leading automotive services. REDBOOK, NATIONAL AUTOMOBILE PARTS AND LABOR MANUALS, etc. Over 85% repeat orders. No objection to non-competing sidelines. EARL B. EATON, Sales Manager, NATIONAL MARKET REPORTS, INC., 900 S. Wabash, Chicago 5.

**DYKEM
STEEL BLUE[®]**
Stops Losses
making Dies and
Templates



Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample
on company letterhead

THE DYKEM COMPANY
2301L North 11th St. • St. Louis 6, Mo.

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CUT SCRAPER TIME
END NIGHT CLEANUP & MORNING REBLUING
DYKEM HI-SPOT BLUE No. 107 is used to locate high spots when scraping bearing surfaces. As it does not dry, it remains in condition on work indefinitely, saving scraper's time. Intensely blue, smooth paste spreads thin, transfers clearly. No grit; noninjurious to metal. Uniform. Available in collapsible tubes of three sizes. Order from your supplier. Write for free sample tube on company letterhead.



THE DYKEM CO., 2301-L NORTH 11TH ST., ST. LOUIS 6, MO.

Circle 185 on Inquiry Card for more data

MECHANICS

Make Roller Bearing Joints
For Every Kind of Product
Application....



FARM MACHINES



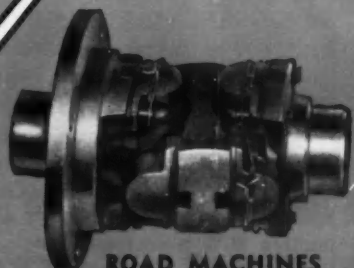
TRUCKS



AUTOMOBILES



FARM TRACTORS



ROAD MACHINES



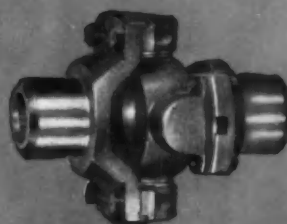
INDUSTRIAL



AIRPLANES



MARINE



MINING MACHINERY

The Adaptability And Dependability Of Our Joints Help YOU Design A More Perfect Product

MECHANICS specializes in Roller Bearing Universal Joints in sizes ranging from 200 to 50,000 foot pounds torque capacity and have perfected these joints to help YOU design a more perfect product. Millions of aircraft, cars, trucks, busses, tractors, farm, marine, construction and industrial machines of all sizes and types benefit from MECHANICS

progressive engineering talent. Practical design, close-tolerance machining and heat treated parts assure smooth running joints and long, dependable service. Let our engineers help you today, send for our NEW FREE CATALOG J-1960, which gives dimensions, capacity tables and complete specifications.

MECHANICS UNIVERSAL JOINT DIVISION
BORG-WARNER CORPORATION

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ROCKFORD, ILLINOIS

Export Sales: Borg-Warner International • 36 So. Wabash, Chicago 3, Illinois

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MECHANICS

B-W

UNIVERSAL JOINT

BORG-WARNER

MORE POWER PER POUND



WITH THE NEW SYNCR ALTERNATOR

Newest, smallest, yet in alternators! Measures $7\frac{1}{2}$ " dia. x $5\frac{1}{4}$ " long, weighs only 26 lbs., yet delivers 1500 watts, 110 vdc, at 1600 rpm.

Designed for refrigeration trucks, taxicabs, police cars and similar heavy duty applications. Also available in 15 volts DC, 1000 watt rating and in AC models.

A semiconductor regulator, supplied as an accessory, holds output to $\pm 2\%$ over a speed range of 1000 rpm to 12,000 rpm. No-load to full load regulation is held to $\pm 12\%$.

Features radially oriented ceramic permanent magnets in the rotor. No brushes, commutators or slip rings.

If you need auxiliary electric power from a tight space, write for more details about this compact Syncro Alternator.

**SYNCR
CORPORATION**
OXFORD, MICHIGAN

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MACHINERY NEWS

(Continued from page 81)

(1) It now understands the tax credit plan is not offered as a substitute for basic reform of tax depreciation;

(2) That a compromise, such as a flat rate credit of 10 per cent of all eligible new investment, would be acceptable. (The flat rate is felt to be more equitable than the bracket plan originally recommended by President Kennedy—see AI, June 15, page 137).

In addition, MAPI suggests that the tax incentive proposal be reviewed separately from the other tax proposals made by the President.

Around the Industry

Waterbury Farrel Foundry & Machine Co.—recently dedicated a new 314,000-sq-ft office and factory building at Cheshire, Conn. The modern single-story plant replaces a century-old multi-building plant in downtown Waterbury, 10 miles away. A division of Textron Inc., Waterbury Farrel makes cold-heading machines, presses, and rolling mills.

Master Chemical Corp. — has produced a 16-mm motion picture called "Down With Unit Cost" and published a bulletin in connection with a formula developed by Dr. Milton C. Shaw of M.I.T. that shows the influence of coolants on machining costs. The formula is tied in with General Electric Company's "Hi-E" program for indicating the high-efficiency range of machining operations.

Ohberg Mfg. Co., Inc.—has established a division, Oberg Carbide Punch & Die, Inc., to handle a new standard line of carbide punches and carbide die bushings, with stock punches (round shapes) ranging in size from .060 to .374 in diam.

Giddings & Lewis Machine Tool Co.—the Davis Div. of the company recently installed improved and enlarged heat-treating facilities, including a nine-cubic-foot nitriding furnace. Installation of the new facilities will reduce de-

livery time by as much as three weeks and enable Davis to furnish case-hardened boring and other tools of any configuration, according to William M. Ritter, Division sales and engineering manager.

Government Publications — an Air Force metals research study, "Evaluation of Numerically-Controlled Machining of Forging Dies," is available from OTS, U.S. Dept. of Commerce, Washington 25, D. C., at \$2.00 (Order PB 171 378). "Standard Shapes, Sizes, Grades, and Designations of Cemented Carbide Products" is the title of a new standards bulletin obtainable from the Government Printing Office, Washington 25, D. C., at 20¢ (designated R263-60).

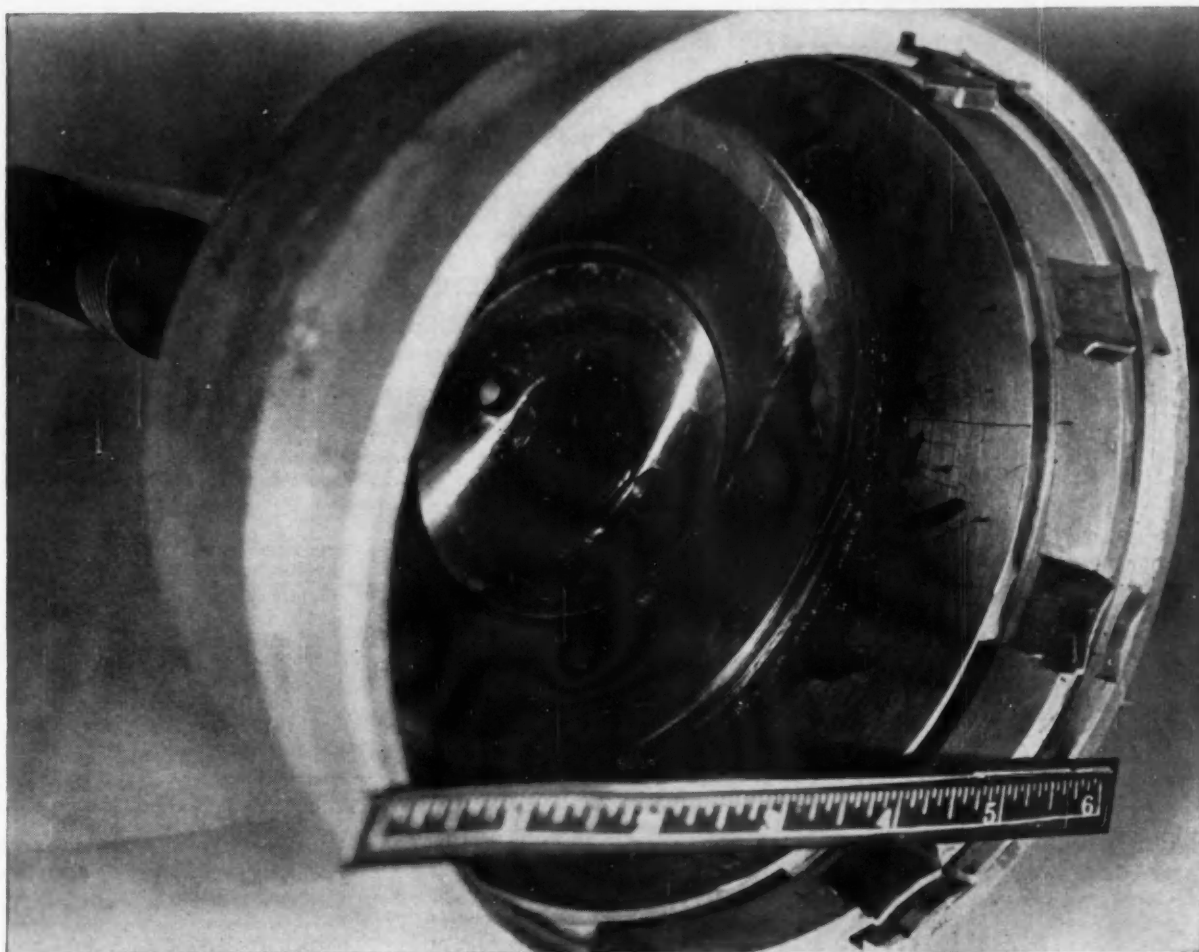
Norton Co.—Harry G. Brustlin, prior manager of marketing services, has been appointed general sales manager of the company's Abrasive Div. Everett L. Sinclair has been named manager, product engineering, grinding wheels; and John U. Calder named assistant to the general sales manager, Abrasive Div.

Thor Power Tool Co.—Clarence B. Bergren, former manager of Thor industrial sales, has been transferred to Tynemouth, England, as managing director of Thor Tools, Ltd. Samuel P. Gartland, former regional industrial sales manager at Indianapolis, has been moved to Turin, Italy, in the new capacity of managing director of FIAP, the company's newly-acquired Italian manufacturing subsidiary. ■

BOOKS...

MANAGEMENT GUIDE FOR PRODUCTION CONTROL, by Bernard T. Lewis and William W. Pearson, published by John F. Rider Publisher, Inc., 116 W. 14th St., New York City, Price, \$1.50. Second of a series, this guide provides a pattern to follow in the application of proven methods of production control.

MANAGEMENT GUIDE FOR PREVENTIVE MAINTENANCE, by Bernard T. Lewis and William W. Pearson, published by John F. Rider Publisher, Inc., 116 W. 14th St., New York City, Price, \$1.25. This part of the series provides a practical approach to the institution of a preventive maintenance program in business, industry and government and military installations. Also, it is a guide to specific problems of methodology and the functioning of a preventive maintenance system.



CYCLEWELD CHEMICAL PRODUCTS DIVISION, CHRYSLER CORPORATION

SEE WHAT RUBBER-BASE ADHESIVE CAN DO?

This is the housing of an automotive torque converter. It's joined to the output shaft by a thin film of thermoset cement.

The converter has just undergone torsional tests that wrecked its mechanical parts—with no effect whatever on the metal-to-metal bond. This bonding job is an achievement of Cycleweld Chemical Products Division of Chrysler Corporation.

A similar cement, made of nitrile rubber and Durez® phenolic resin, cut the cost of assembling an all-aluminum truck tailgate by eliminating 211 rivets and 42 welds.

Other heat-setting cements that marry rubber and phenolic resin show promise for:

- building new strength and quietness into car doors, deck lids, and hoods by edge-bonding instead of tack welding.
- attaching metal trim without drilling holes.

- easy-to-cast aluminum engine heads and intake manifolds, made in *two* sections bonded together with a leakproof, heatproof seal.

If you have a tougher-than-usual bonding problem—or expect to have one—now's the time to see what a rubber-phenolic adhesive can do for you. We'll be glad to put you in touch with people who make such adhesives.

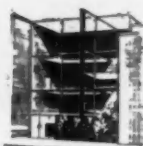
We don't make these adhesives. We just supply some of the basic ingredients—phenolic resins that influence the qualities a good structural adhesive must have. Permanent, rigid set. Controlled tack. Heat resistance. Precise sameness from batch to batch. Good storage stability. Many superstrong adhesives are the result of teamwork between rubber chemists and Durez resin chemists backed by 40 years of experience.

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HOOKER CHEMICAL CORPORATION, 8207 WALCK RD., NORTH TONAWANDA, N. Y.

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By C. J. Kelly
ASSISTANT EDITOR

Inserts

Kendex Tailored Tooling is the title of a new 8-page booklet which shows how to use a new line of standardized adjustable units with "throw-away" insert. Features, mounting methods, and complete specifications are given. *Kenna-metal Inc.*

Pillow Blocks

Folder 2951, "Series P2-300 Self-Aligning Ball Bearing Pillow Blocks," details information on the new bearings which are available in 31 shaft diameters. A full page chart shows interchangeability dimensions in relation to other bearings. *Link-Belt Co.*

Seal Technology

This brochure explains the causes of lip seal leakage, tells some principles of good sealing, and discusses a method of stopping leakage through the use of lip seal testing machines. The information in the brochure is based on a four-year research project by the Laboratories into the causes of lip seal leakage. *General Motors Research Corp.*

Grinding Wheels

Folder 222-16 describes and illustrates a line of cutting-off wheels specially formulated for longer life and elimination of burn. The "66 Bond" grinding wheels utilize a new laboratory development, K-1017, to make them more resistant to water vapor and coolant. The folder contains specification data of wheels for cutting off aluminum, steel, brass, bronze, cast iron, nickel, stainless, Stellite and other materials. Wheels are available plain or reinforced and in a wide range of sizes. *Peninsular Grinding Wheel Co.*

Photocells

A new industrial application leaflet contains a comprehensive report of typical production problems solved with electric eyes. This literature is entitled: "Can photocells do the job for you?" In addition, this four-page leaflet includes photographs and sketches illustrating the various applications. This data will be helpful for production engineers, plant engineers, etc., that are seeking economical and dependable methods for detection, counting, control, etc. *Photomation, Inc.*

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Tool Tips

6

Volume 36, Number 6 Tool Tips discusses various types of machines and machining operations. There are 45 different brochures illustrated in the center fold of this booklet. The different publications are designed to help cut costs and cover many different machining operations and various types of equipment. *Ex-Cell-O Corp.*

Gasket Materials

7

Resistance ratings for 120 fluids and gases are discussed in a new 24-page bulletin. Technical data charts are shown to cover specification information in easy reference form. Newer gasket materials are also covered. *Garlock, Inc.*

Boring Machines

8

Two-color, 12-page booklet covers standard precision boring machines. This condensed form bulletin points out the advantages of various models for different sizes and types of work, describes the machines and lists the most important specifications. It lists the whole line so that interested persons may request literature of more detail on particular models. *Ex-Cell-O Corp.*

Butyl Rubber

9

Colorful folder lists prices, grades, terms and conditions for purchasing butyl rubber. All recent additions and changes are covered in this literature. *Enjay Chemical Co.*

Axle Shafts

10

This brochure pictorially illustrates the various production techniques used to manufacture precision shafts for industry. It briefly describes the special alloy steels used in shaft production. Testing, inspection, heat treating and shot peening and other processes are also covered. *U. S. Axle Co., Inc.*

Special Report

11

Steam cleaning-phosphatizing equipment is discussed in a new 8-page report. Complete specifications for both gas-fired and fireless models are given. Illustrated with step-by-step photographs, it delineates features, processes, operating procedures, cost tabulations and results. *Kelite Corp.*

Truing Tools

12

A new 4-page catalog folder entitled "Victory Diamond Dressing and Truing Tools," explains the importance of good quality diamond tools. Technical illustrations and specifications of standard tools are shown. The folder also carries information regarding coned radius dressers which include: coned wheel dressers, thread grinding diamonds, and tools for miniature bearing industry. *Victory Diamond Tool Co.*

Steel Design

13

Four papers which discuss continuing advances in the strength levels, product forms and design applications of constructional steels are printed in a 59-page brochure, "New Concepts in Steel Design and Engineering." Illustrations and descriptions of many actual designs and design concepts show how these steels can be used in structures and equipment to achieve higher strength, lighter weight and lower costs. *Market Development Div., U. S. Steel Corp.*

Tool Catalog

14

A new catalog of carbide tools with Kennametal material was recently published. Featured in this new 36-page catalog and price list are carbide tipped tools, blanks, inserts and holders. *Besly-Wellex Corp.*

Air Compressors

15

Included in Catalog 20, 16 pages, is data on more than 200 models—both gasoline and electric driven—featuring automatic start-and-stop and constant-running units, plus illustrations and descriptions of compressors available with either horizontal or vertical tanks. Also shown is a cross-sectional view of the basic Lincoln compressor and loadless starting device. *Lincoln Engineering Co.*

Dip Brazing

16

An aluminum fabrication technique designed to produce economical, quality-assured components for a wide line of hardware items used in aero-space, electronics and commercial fields, is the subject of an 8-page illustrated technical brochure prepared by *Precision Dip-braze, Inc.*

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Lock Washers 17

"How to Select the Right Lock Washer to Meet Job Requirements" is the title of a new booklet that describes the various types of lock washers and when to use them. This fact-filled, 12-page brochure highlights the particular advantages of each type of standard lock washer plus special stampings. It also lists the types of applications for which each is best suited and why. *Shakeproof Div., Ill. Tool Works.*

Metal Finishing 18

Four-page guide contains condensed information on materials and compounds for such finishing operations as buffing, burring, polishing and satin finishing. There is also a section on additives and specialties for bright plating processes for gold, silver, copper, nickel, cadmium, brass and zinc plating. *Lea Mfg. Co.*

Tungsten Alloy 19

Kennertium W-10, a heavy tungsten alloy, is presented in a newly revised, illustrated bulletin, B-500. The 8-page booklet announces improved properties of this material and shows many applications in the fields of radioactive shielding, balancing and high inertia rotational applications where maximum weight is required in minimum space. *Kennametal Inc.*

Broaching Machines 20

A new four-page illustrated brochure showing engineering features and listing specifications of the recently introduced GBP Series standard broaching machines is offered by *General Broach and Engineering Co.*

Designers Brochure 21

Intended to assist both the design engineer and the buyer of spring components, a comprehensive new "spring handbook" has been published. Fully illustrated with a wide range of samples from actual production, the new brochure discusses the features of precision springs of every possible type. Design formulas are explained in detail, and other reference material valuable in determining the user's spring needs is presented in graph and table form. *The Timms Spring Co.*

Generator 22

Technical bulletin 710 describes in detail a new inert atmosphere generator. This bulletin covers construction, combustion system, combustion chamber, condenser, and safety equipment. Illustrations, specifications, and a schematic diagram are shown. *Lindberg Engineering Co.*

Engineering Service 23

A new 12-page, two-color brochure describes free special engineering service and how it helps cut costs for industrial truck users. The brochure shows a dozen typical examples of actual production problems solved by special mechanical handling equipment recommended through the special engineering service. *The Elwell-Parker Electric Co.*

Crane Specs 24

A new specifications tablet contains five duplicate sets of crane specification data and forms designed to aid in establishing crane specifications for a given application. The tablet gives data on classes of service, speed classifications for bridge, trolley and hoist, and information on girders, trucks, electrical systems, brakes, cabs and other components and design considerations involved in an overhead electric crane specification. The data applies to industrial type cranes of any manufacture. *Conco Engineering Works, Inc.*

Coated Steels 25

An attractive two-color brochure discusses the wide industrial applications of coated strip steel. Along with illustrations, it details size ranges, forming, welding, soldering, cleaning, chemical treatment, temper classifications and Preece tests. *Sharon Steel Corp.*

Push Buttons 26

Bulletin GEA-7127A, 12 pages, is a revised publication that includes new forms added to a complete line of industrial, miniature, oil-tight push buttons. Four-color photo shows many color combinations and added flexibility now available in this line. Photo and diagram explain the 40 per cent space savings which may be realized in enclosures or panels by the use of the miniature forms. *General Electric Co.*

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Polymers 27

"Polymers for Core Oil" is the title of a new two-color booklet. This attractively illustrated guide relates how polymers in core oils produce cores of greater strength and uniformity and how faster baking speeds may be obtained. Velsicol Chemical Corp.

Torque Testers 30

Three pages discuss the application, operation and specifications of dynamic torque testers. Illustrations and line drawings are shown along with data on the features of these units. Scully-Jones and Co.

Screw Machines 28

A complete line of standard screw machine tools are covered in an illustrated brochure. Data includes specifications and prices numerous parts and components. Line drawings, charts and application data are also covered. Mueller Industries.

Lathe 31

Specification charts, line drawings, general construction and features are all covered in a new publication concerning the Mult-automatic multi-chuck lathe. Capacities, components and all other pertinent data are given. Bullard Co.

Sealing Methods 29

A new 8-page booklet, Bulletin WB-1, entitled "How, When and Why to use a V-Band Coupling" is now available. It explains how the simplified fastening of the V-Band Coupling can improve functional design and product appearance, decrease assembly time and cut manufacturing costs. The "How, When and Why" booklet also illustrates a few of the many available coupling and flange configurations, explains the sealing principle and shows typical V-Band applications. Marman Div., Aeroquip Corp.

Buyer's Guide 32

Selection chart, application data, size ranges, relative costs and "how to save" information are all covered in a new brochure concerning tubing. The theme of this literature is "Tubing or Bars." Joseph T. Ryerson & Son, Inc.

Rolled Threads 33

Called "Design A B C's of Rolled Worm Threads," a 9-page booklet shows by line drawings the principles and operations of rolling threads. General rules for design and practice for rolled worm threads are covered in the booklet. Landis Machine Co.

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7/15/61

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YOUR NAME

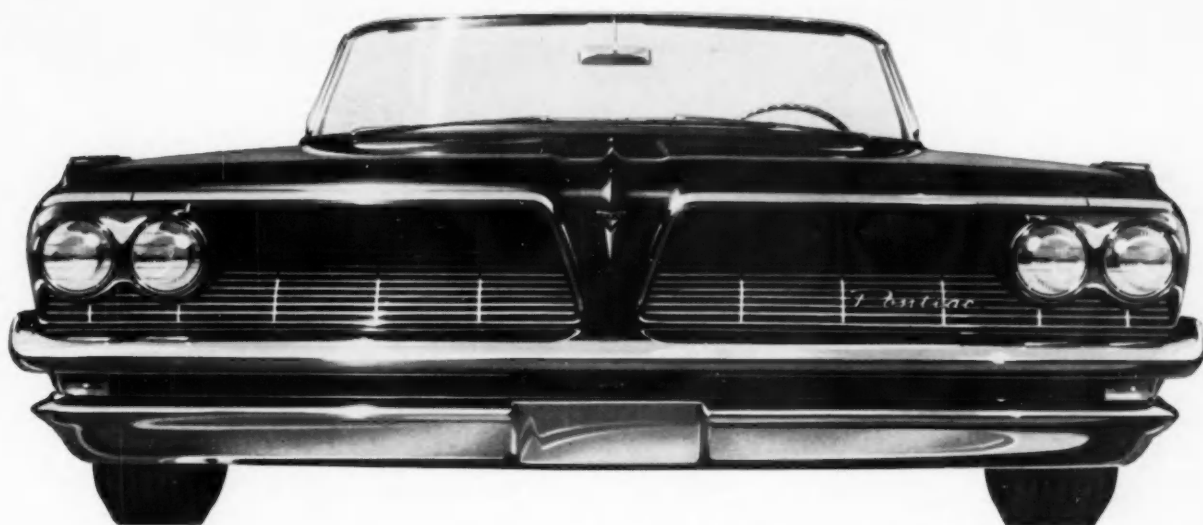
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WIDE TRACK
OR THE
HOT TOPIC**

*Rochester Carburetors are tailor-made
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Here's a pair of performers with a lot of get-up-and-go. Under their hoods are Rochester Carburetors that have been precisely designed and refined to give each engine fast response and gas-saving mileage.

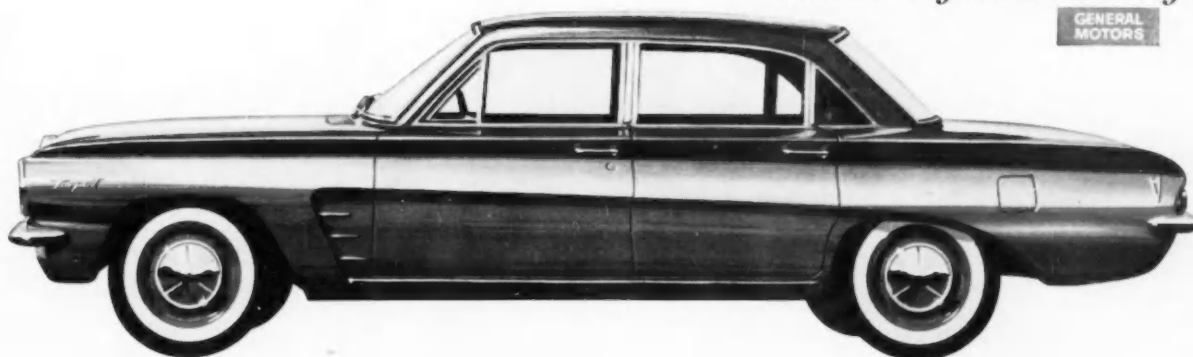
This kind of performance results largely from Rochester Reliability . . . the approach to design, development, manufacture and testing that imposes the most rigid standards of excellence on Rochester Carburetors. And the proof is in the testing.

Rochester Carburetors are subject to the most brutal driving tests imaginable . . . in the plant, at the proving ground and on the road. After that, trained field men follow through and report back with performance data that is analyzed for further product improvement.

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ROCHESTER CARBURETORS

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**...This
hole
is
money
in
your
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You cut the cost of making ring-shaped tool steel parts when you make them from Graph-Mo Hollow Bar®. You can start with finish boring because the hole's already there. You eliminate one big machining operation.

And you keep right on saving. You'll machine Graph-Mo easier because the free graphite in its structure makes it machine 30% faster than ordinary tool steels.

Your Graph-Mo parts will last longer too. Diamond-hard carbides in its structure make it outlast ordinary tool steels three to one, according to actual user reports.

You can't beat Graph-Mo for stability, either. A master plug gage made of Graph-Mo showed less than ten millionths of an inch dimensional change after twelve years of use.

There is only one Graph-Mo and the Timken Company makes it. Buy it in the hollow bar form for your ring-shaped tool steel parts and save. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable: "TIMROSCO." Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits.

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Fine Alloy **STEEL**

IN 44 CITIES IN THE UNITED STATES AND CANADA



